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Rolling Threads on Container Caps

By S. A. HAND
Associate Editor *American Machinist*

Probably no industry has been less influenced by standardization than that engaged in the manufacture of screw caps for bottles, jars and other like containers. The existing variations in the shapes and pitches of the threads in use are the result of the manufacturers having no well-defined standards; and as far as any attempt at standardization is concerned, the whole business appears to be in a state of utter chaos.

THE threads on container caps are formed by rolling in a machine, the principles of which may be easily understood. The machines themselves may vary from very simple hand machines to those which are entirely automatic and quite intricate. Fig. 1 illustrates a simple machine for either hand or power built by the Ferrachute Machine Co., Bridgeton, N. J., many years ago at a time when containers requiring screw caps were limited (as far as glassware is concerned) practically to fruit jars. The roll upon which the cap is mounted for threading is attached to the fixed spindle at *A* while the outer roll is attached at *B* to the spindle carried by the swinging yoke *C*, the yoke being mounted on the shaft *D* on which it is free to swing. Motion to bring the axes of the spindles toward each other is derived from pressure on the treadle *E*, and the return to the normal position is by the counterweight *F* when the treadle is relieved from pressure. A sketch of a set of threading rolls for this machine is shown in Fig. 2. *A* is the roll on which the cap is placed for threading and on it the thread is cut right hand though it revolves in a left-hand direction as shown by the arrow. In this machine the rolls are provided with threaded shanks for screwing into the spindles and the shank of the roll *A* is cut with a left-hand thread to prevent it from unscrewing while in operation. The outer roll *B* has a left-hand thread cut on it and runs in a right-hand direction, but as its shank faces the opposite way to that on the roll *A* the thread on that part is also left hand.

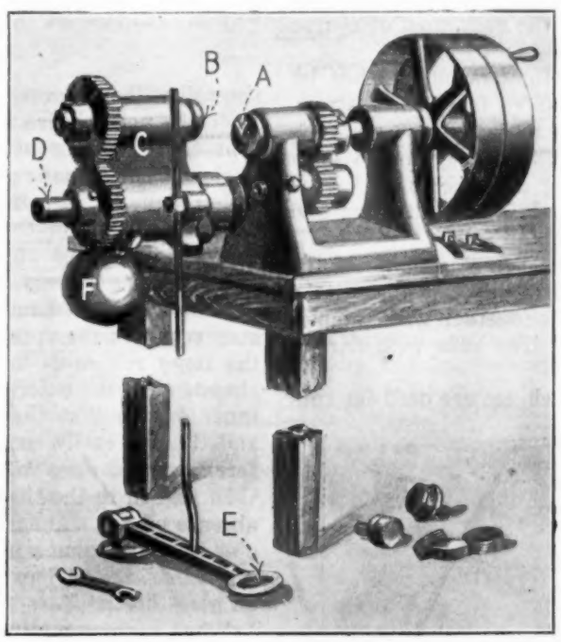


FIG. 1. A THREAD-ROLLING MACHINE OF THIRTY YEARS AGO

Usually, both rolls are made with equal diameters. However, if the caps are very small and the construction of the threading machine is such that the spindles cannot be brought close enough together, the outside roll may be made any number of times larger than the inner roll. In that case the lead of the thread on the outer roll must be increased and the speed decreased so that the helix angles and peripheral speeds will be the same on both rolls.

Referring to Fig. 2 it will be seen that roll *B* is larger than roll *A* and that both rolls are provided with flanges. In the earlier design of threading rolls it was thought advisable to make the outer roll the larger and to run both rolls at the same number of revolutions per minute. This of course caused considerable slippage between the outer roll and the cap, which not only prevented the cap from unscrewing while being threaded but was thought to make a more perfect thread by the ironing action imparted. Both rolls were provided with flanges to insure the cap being held in the proper location during the operation of threading. Later practice has shown that it is necessary to provide only the outer roll with a flange.

In operation, the cap is placed on roll *A* and roll *B* brought to bear upon it with sufficient pressure to force the metal of the cap into the threads of the rolls. One revolution plus a slight overtravel is all that is necessary to produce a full thread on soft or thin metal, while for hard or thick metals two or more revolutions may be required.

After the cap is threaded the rolls are separated, when a slight pressure of the hand on the cap will cause it to unscrew from the inner roll. As before stated, this roll runs in a left-hand direction and it will be understood that it is not necessary either to stop the machine

FIG. 3. CAM-OPERATED THREAD-ROLLING MACHINE

or to reverse its direction of motion in order to remove the cap. Caps are also placed in position while the machine is running.

Caps may be either beaded or knurled while the threads are being rolled, though the rolls must of course be properly made for the purpose.

Fig. 3 illustrates a thread-rolling machine made by the E. W. Bliss Co., Brooklyn, N. Y., in which the rolls are automatically advanced and retired by a cam, sufficient dwell being given in both the closed and open positions to allow for threading and feeding. In the operation of this machine the only attendance required is to put on and take off the caps.

A close-up view of a set of rolls in a machine of the type just described is shown in Fig. 4, while Fig. 5 illustrates three sets of such rolls together with samples of the work produced by them. The rolls with flanges on them are the outer rolls.

Several types of automatic machines are used for roiling threads. In these the caps are fed from a magazine to the rolls, where they are threaded and ejected, one operator looking after a battery of machines.

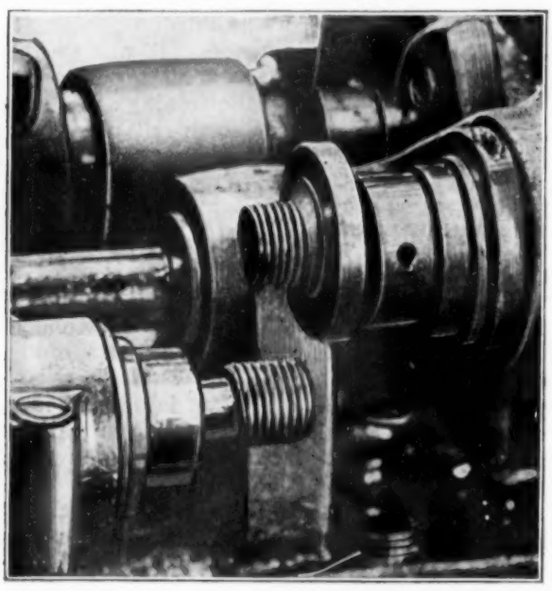


FIG. 4. CLOSE-UP VIEW OF THREADING ROLLS IN A MACHINE OF THE TYPE SHOWN IN FIG. 3

The best grades of caps are made on the hand machines where the caps and the inner rolls are made to fit each other and where both rolls are of the same diameter. In such cases the rolling action is somewhat like that of spinning and brings the metal of the cap in close contact with the inner roll, the product being uniform in size.

In automatic machines the rolls on which the caps are placed must be enough smaller than are the caps, after the thread has been rolled, to permit their ejection from

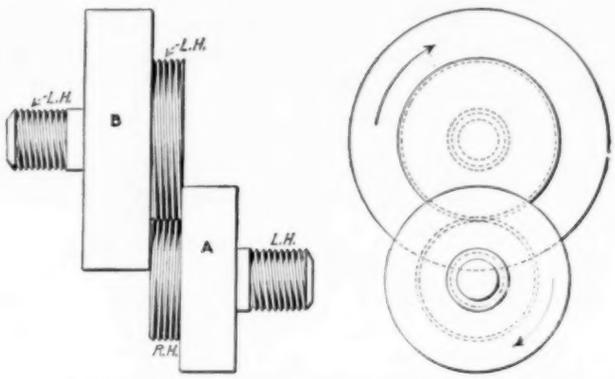


FIG. 2. SKETCH OF ROLLS USED IN MACHINE SHOWN IN FIG. 1

the roll without reversing the machine. The outer roll is of the normal size and it will be readily understood that there will be some slippage and that the helix angles of the threads on both rolls will not be the same. This results in stretching the metal in the caps and any difference in either the temper or thickness will result in wide variations of size in the product.

In the case of very soft metal, such as the zinc used in fruit-jar caps, having both rolls the same diameter may result in the spinning action closing in the cap on the inner roll so as to make it difficult to remove. To obviate this, the outer roll may be made larger than the inner one so that the metal will be slightly stretched and the cap easily removed. However, this actual difference in roll sizes will have to be found by experiment.

In regard to the threads used there appears to be an absence of any standard as to pitch in relation to diameter or as to shape and clearance. Fig. 6 illustrates sections of the various shapes of threads commonly used on glass bottles, jars, etc.

When a new container is to be made the procedure is about as follows: The size of the opening is decided upon and a cap (of which glass manufacturers carry a full line of samples) picked out. The model maker makes a wooden model or pattern of the container to be made. This may be made from a sketch or from some stock container with certain changes as per verbal instructions—most likely the latter.

When the model is approved the job is sent to the mold maker who proceeds to make the mold. When he comes to getting out the threaded ring, which is the part of the mold that forms the thread on the container neck, he cuts the thread with a tool that is ground, not to a gage but to the shape and width he judges to be about right. When he thinks the thread has been cut deep enough he makes a lead cast from the ring on which he tries the cap. If the fit is not right he takes

FIG. 5. THREADING ROLLS AND SAMPLES OF WORK

another cut, makes another lead cast and again tries the cap. At last the ring is finished by the cut-and-try method and all is lovely until production starts when the fun begins.

The screws on the container necks do not all come out of the mold alike. If the mold is too cold the threads will not fill the ring and the diameter over their tops may be so small that the cap will slide on and off without engaging the threads. A container with this defect is known as a minimum. If the container is taken from the mold when too hot and before the glass has set, the neck containing the threads may be out of round so that the cap will not screw on. Such a container is known as a maximum.

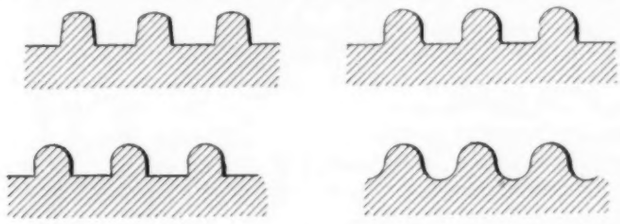


FIG. 6. VARIOUS SHAPES OF THREADS ON GLASSWARE

In such cases the glass manufacturer sends sample maximum and minimum containers to the cap maker with instructions to make a cap to fit both.

If the cap is prevented from going on the maximum container by interference at the top of the threads, increasing the diameter over the threads on the cap will permit it to be screwed on and if there is any clearance between the cap and the container at the root of the thread, the threads on the cap may be deepened enough so that they will engage with those on the minimum container. This of course will necessitate the making of a new set of threading rolls and a new lot of caps. In cases where the trouble cannot be remedied in the above manner, two sizes of caps will have to be made.

From the foregoing it will be seen that this industry is at present entirely dependent on cut-and-try methods and that there is an excellent chance for some one to take hold and standardize it.

A New Aluminous Abrasive

By Otis Hutchins

Present-day grinding has become so highly specialized that abrasive manufacturers have found it necessary to carry on experimental and development work, with the idea of perfecting abrasive materials and making grinding wheels that will definitely meet the exacting needs of the grinding industry.

The Carborundum Co. has perfected a new abrasive material known as Aloxite AA, having characteristics which appear to be ideal for the grinding of reamers, cutters and small tools; also for certain kinds of cylindrical grinding. Still another field in which this new abrasive is expected to show marked efficiency is in the surface grinding of broad surfaces on vertical grinding machines, particularly where a large amount of stock is to be removed in a short time.

The bulk of the aluminous abrasive now used in grinding operations contains from 92 to 96 per cent. alumina, 2½ to 4 per cent. titanium oxide, ½ to 1 per cent. each of iron oxide and silica, and lesser amounts of lime and magnesia. Most of the alumina is present in the crystallized state, while the other impurities combined with a small portion of the alumina form a glass which functions as a matrix or cement holding together the crystals of alumina. These crystals are composed of practically pure alumina and have all the characteristic hardness of our natural jewels, the ruby and sapphire.

The shape and size of the alumina crystals and the amount of matrix present have an important bearing upon the characteristics of the abrasive, and a study of the internal structure of the abrasive is of great importance. The method now generally used for this investigation is by means of thin sections cut from a massive lump of the abrasive. A microscopic study of these thin sections shows the size and shape of the alumina crystals and their arrangement.

Fig. 1 is a microphotograph of an aluminous abrasive of the ordinary type containing about 94 per cent. of alumina. The white areas represent crystals of alumina, while the black patches surrounding the white areas represent the matrix holding together the crystals. Fig. 2 is a microphotograph of an aluminous abrasive of the ordinary type containing about 96 per cent. alumina.

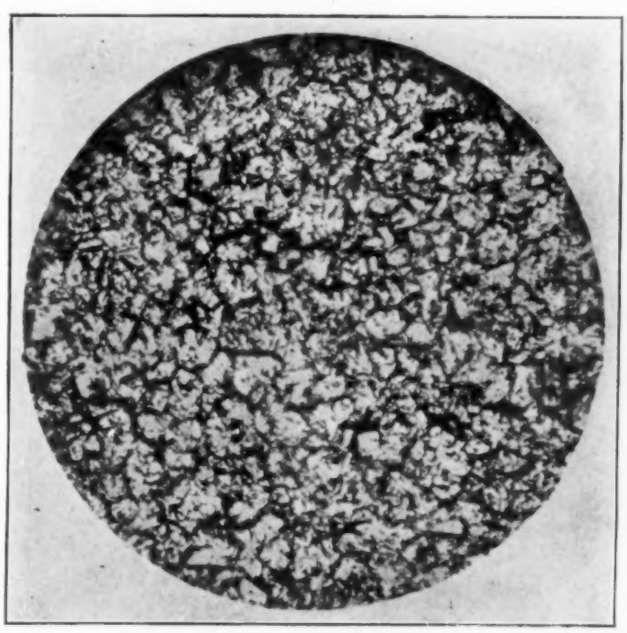


FIG. 1. ORDINARY ALUMINOUS ABRASIVE (94 PER CENT. ALUMINA)

FIG. 2. ORDINARY ALUMINOUS ABRASIVE (96 PER CENT. ALUMINA); TAKEN BY POLARIZED LIGHT

This photograph was taken by means of polarized light to better bring out the size and shape of the crystals. The average size of the alumina crystals is about 0.7 mm. The types of abrasive represented by Figs. 1 and 2 are admirably suited for general grinding and are used in large quantities. The illustration, Fig. 3, is a microphotograph taken with polarized light of a thin section of Aloxite AA.

The areas of the same color in the photograph represent the same crystal growth and show the alumina crystals to be of very large size. In some cases these crystals are 12 mm. or more in size. The amount of impurity present is about 1½ per cent. or very much less than is found in the ordinary type of aluminous abrasive. This decreased amount of impurity has an important bearing on the characteristics both of the abrasive grain and of the wheel made from it. The cutting power is increased due to the greater amount of crystallized alumina present. There is less fluxing between the bond and the grain which results in a brittle wheel so necessary for rapid cutting. It also makes possible, due to the high purity of the grain, the production of wheels of very soft grade. The small amount of impurities allowed to remain in the abrasive is not objectionable, but on the other hand is extremely beneficial, as it prevents both the formation of skeletal crystals and the more or less open and porous structure which obtains when molten pure alumina is allowed to solidify. The resulting abrasive consequently exhibits a greater toughness and imparts a longer life to the wheel.

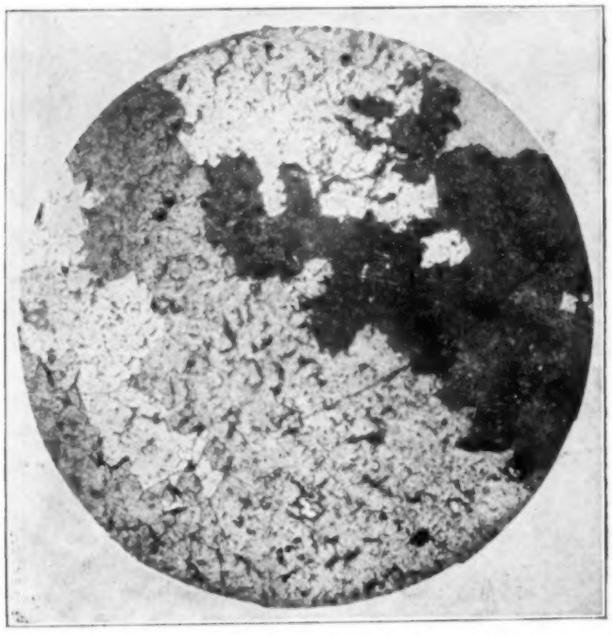


FIG. 3. THIN SECTION OF ALOXITE AA; TAKEN BY POLARIZED LIGHT

Large Alumina Crystals Important in Cutting

The large size of the alumina crystals in Aloxite AA has an important bearing on the cutting power of the abrasive. As the grits commonly used are 20 and finer, almost every individual grit will consist of a fragment broken from a larger crystal of alumina, and due to this fact possesses exceptional sharpness. During the process of grinding, there is a breaking down of the abrasive grains in a wheel and the character of the new cutting edges exposed depends largely upon the size of the alumina crystals in the original abrasive. When the alumina crystals in the abrasive are small, a rupture of the grain may mean a tearing away of a few small crystals without fracture. However, when the crystals are large and a rupture occurs in an abrasive grain, it means that a crystal of alumina has been fractured and that new sharp cutting points have been produced.

In summing up briefly it may be said that Aloxite AA is composed of nearly pure alumina with just enough impurity present to produce a desirable toughness and furnish an abrasive which will have a long life when used in a grinding wheel. It is possible to manufacture from this high-purity grain a bonded wheel of brittle nature, soft and uniform in grade, of open structure, yet which will be fast and cool cutting.

Rotary Bushings

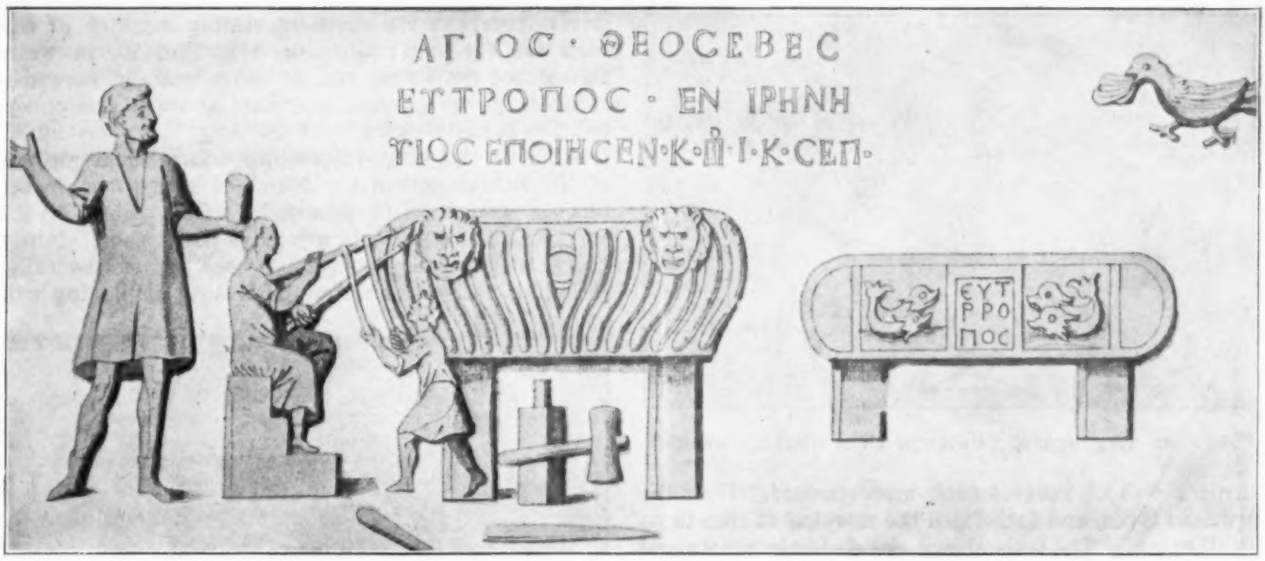
By Wm. C. Betz

I have read with interest the articles on rotary, or floating bushings as we call them, and would add our experience with this type of bushing and method of making them.

Some years ago we were experiencing considerable trouble with the bearings and bushings of countershafts on our automatic screw machines; a bushing wouldn't last three months on the loose pulley, so we decided to do a little experimenting. We used the floating type of bronze bushing, allowing only 0.002 to 0.003 in. between the shaft and the bushing and 0.001 to 0.002 in. between the bushing and the pulley bore.

We drilled the oil holes and plugged all but two rows at opposite sides of the bushing with hard graphite grease, filling the unplugged holes with heavy engine oil to float the graphite. We have had very little trouble from this source since.

Some of these counters have been running two years since the last repairs were made and show no appreciable wear to date. I believe in the floating bushing on small-diameter, high-speed shafts where the load is not excessive.



The Evolution of the Workshop—II

By H. H. MANCHESTER

Prior to 875 B. C., construction work of all kinds was done, on the whole, by manual labor. With the advent of a combined use of the wheel and the lever and their applications in various forms, methods and tools for such tasks developed rapidly. (Part I appeared Oct. 30, 1919.)

WHILE the earliest records of workshops come from Egypt, as has been seen in our previous article, it is of course true that, during much of the Egyptian era, metal work was almost as common in southwestern Asia as it was in Egypt. Unfortunately, however, there are no Asiatic pictures of shop interiors at that period extant to enlighten us as to the methods employed, though it is advisable to note the entry into civilization of several great inventions in Asia which have since had a marked influence on the machine shop.

Bronze probably originated in Asia, where copper and tin were both native. Tools of this metal are found in the Chaldean graves of perhaps 2500 B. C. The Phœnicians were great traffickers in tin at a very early date, and skilled workers in bronze before the time of Solomon. Iron itself may have first been used among the Hindoos, who appear to have known of it at the time of the Rig Vedas as early as 2500 B. C.

Although the wheel and the lever had been known for some time, the first evidences of both the lever and pulley date from about 875 B. C., when they were depicted in a bas-relief, at Nineveh. Among the remains of Nineveh, hammers were found. The handles were fitted into sockets in the heads, which was a vast improvement over the Egyptian form. These relics also include files of bronze, iron, and steel, which were essentially a new tool devised to be an improvement over the prehistoric flint scrapers and sandstone smoothers. The discoveries at Nineveh also included screws, nuts, heavy chains and grappling irons.

FIG. 7. A BLACKSMITH'S SHOP, FROM AN ANTIQUE GREEK VASE

Perhaps the earliest Greek picture of a metal workshop is found on an archaic vase, Fig. 7. In this the furnace is in the shape of a bee-hive, and appears at the left of the picture. This interpretation of it is made certain by a comparison with pictures showing potters' furnaces of the same general date. The anvil is still only an ordinary block, and in fact is cruder than the anvils of the Egyptian period. The hammers show the improvement of handles running through the head; the tongs are jointed instead of being merely of the spring type, as were the Egyptian; and the saw has a curved back for a handle.

Probably the most important improvement which can be traced to early Greek times was made in the design of the furnace. This seems to have preceded the discovery by Theodorus of Samos in 532 B. C., according to Pausanias, of the method of melting and casting iron. This improved furnace, shown in Fig. 8, consists of a round stack about six feet high. It has a semicircular opening at the bottom, and is blown by a bellows of goat skin which appears at the back of the stack. On top of the stack is what seems to be a ladle which was presumably used to hold metals like copper and tin. An improvement in the bellows was said to have been made about 250 B. C., by Ctesibius, to whom is ascribed the invention of the bellows constructed of wooden leaves equipped with handles. This

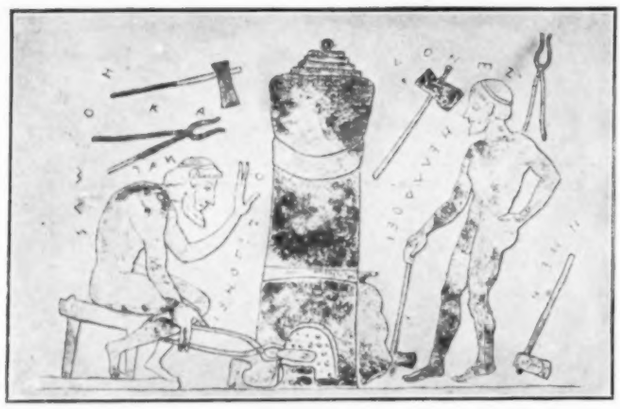


FIG. 8. THE STACK FURNACE IN A SMITH'S SHOP

furnace was of course much more powerful than the previous types, and facilitated the working of iron to no small extent. The tools shown are sledge hammers and jointed tongs.

Invention of the Hoist

The hoist or derrick made its appearance at this time and was used largely in architectural work. Other tools of the Greek period were jointed shears and planes formed by setting a chisel in a frame, but whether they were first invented in Greece or elsewhere is uncertain.

A fair idea of the bronze statuary shop of the classic period is illustrated on a Greek bowl, Fig. 9. This depicts the stack furnace with a helper working a hand bellows behind it. The statues were evidently made in parts, and the head and feet especially were joined on afterward. The only novel tool shown is a straight saw with a handle which could be worked with both hands. Its illustration here indicates that it was employed for sawing metal.

In both the Greek and Roman periods the greater part of the work was done entirely by either slaves or freed slaves, and it is significant that the early machines were designed to make use of power furnished by the

FIG. 9. MAKING BRONZE STATUES

slaves. Perhaps the most interesting machine of this sort was the tread-wheel derrick, Fig. 10, in which slaves trod the inside rim of the wheel and furnished sufficient power through a system of ropes and pulleys to raise heavy weights.

Some of the most interesting occupational pictures of the Roman period are found on grave monuments, plaques, and even in catacombs. One plaque of this sort, Fig. 11, represents a woodworker's shop. It portrays the various tools then used in woodworking, including perhaps the first illustration of planing with

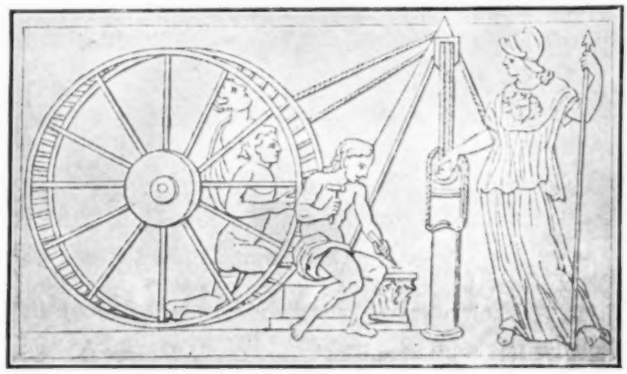


FIG. 10. AN ANCIENT ROMAN TREADMILL

FIG. 11. A ROMAN WOODWORKER'S SHOP

a set plane. It will be observed that the bow drill was still employed, and that the bucksaw had come into use.

Among the pictures of the Roman period, illustrating metalworkers' shops, are several paintings depicting the forge of Vulcan. Most of these are more artistic than enlightening from a technical standpoint. The same may be said of several sarcophagi illustrating cupids forging, and other work. Two pictures illustrating especially toolmaking and a toolmaker's display are interesting in the types of instruments they picture, even more than in any special processes which they disclose. There is also one picture which delineates a portable furnace and forge in which the furnace in particular seems to be of a new type.

Just before the time of Augustus there were introduced into Rome and set up on the banks of the Tiber a few small waterwheels. The waterwheel is said to have been invented in Cappodacia during the reign of Mithridates and used for grinding grain. It was very crude and hardly able to compete with the slave labor of the period.

However, in the time of Ausonius in the fourth century A. D., we hear of it being employed to saw stone with the aid of toothless saws and sand. It was at all events of great importance as the first practical use of natural power to do work, and as a machine it was destined to revolutionize the labor of the later Middle Ages and early Modern Period.

Geometrical Progression of Speeds in Machine Tools

By C. C. STUTZ

The method of proportioning the speeds of machine tools given here is presented as a logical and readily understandable system which may be applied to almost any problem of this type.

IN DESIGNING machine tools of any type it is now an accepted practice to so proportion the speeds that they will form among themselves a geometrical progression, so that each speed is increased from the preceding speed by the same multiplier.

We shall not concern ourselves here with the problem of arriving at the proper minimum and maximum speeds best adapted for any particular design in hand, but shall consider these two speeds as having been determined. The total number of speeds desired shall also be a known quantity.

Let there be:

a = slowest speed;
b = fastest speed;
n = total number of speeds;
$n-1$ = total steps or intervals between total number of speeds;
f = ratio of one step, or factor wherewith to multiply any speed to obtain the next higher speed;
d = number of steps in cone pulley.

Algebraically expressed, the various speeds, therefore, form the following series:

$$a,\ af,\ af^2,\ af^3,\ af^4 \ldots\ldots\ldots af^{n-2},\ af^{n-1}$$

The last or fastest speed, is expressed by both af^{n-1} and b; therefore:

$$af^{n-1} = b, \text{ or } f^{n-1} = \frac{b}{a}, \text{ from which}$$

$$f = \sqrt[n-1]{\frac{b}{a}} \qquad (1)$$

By multiplying the slowest speed a by the factor f, we obtain the second speed and so on through the whole series.

As a rule the number of speeds n is such that it can not be obtained by a cone pulley alone, and the machine is therefore either back geared or triple geared, or perhaps even quadruple geared. In such a case it is a simple matter to obtain these gear ratios as will be shown.

Assuming as an example a lathe with a four-step cone, ($d = 4$), triple geared. This would give us: Four speeds with cone, four speeds with cone and back gears, four speeds with cone and triple gears; or 12 speeds in all, and the series (from the fastest to the slowest speed) would be: af^{11}, af^{10}, af^9, af^8, af^7, af^6, af^5, af^4, af^3, af^2, af, a.

It will be noticed that these three sections of the full series (each forming a series) bear the following relation to each other:

1. The second series can be obtained by dividing each member of the first series by f^4. In this case f to the fourth power is the ratio of the back gears.

2. The third series can be obtained by dividing each member of the first series by $f^4 \times f^4 = f^8$. In this case f to the eighth power is the ratio of the triple gears.

As the actual calculations are best carried out by logarithms we can summarize the above by writing

the log of ratio of back gears $= d \log f$ (2)
the log of ratio of triple gears $= 2d \log f$ (3)
and the log of ratio of quadruple gears $= 3d \log f$ (4)

Example 1. A triple-geared lathe.

Proportion the speeds and find the gear ratio of a six-step cone, triple geared. $6 \times 3 = 18$ speeds in all.

Slowest speed = 0.75 r.p.m.
Fastest speed = 117.00 r.p.m.

We have:

$a = 0.75$
$b = 117.00$
$n = 18.00$
$n-1 = 17.00$
$d = 6.00$

$$f = \sqrt[17]{\frac{117}{0.75}} = \sqrt[17]{156}$$

As mentioned above, the calculation is very readily carried out by the use of logarithms. We have

$$\log f = \frac{\log 156 = 2.1931246}{\log 156 = 0.1290073}$$
$$f = 1.3456$$

The series of speeds is as follows:

log 0.75 = 0.8750613 — 1	= log	0.75
log f = 0.1290073		
0.0040686	= log	1.009
0.1290073		
0.1330759	= log	1.358
0.1290073		
0.2620832	= log	1.828
0.1290073		
0.3910905	= log	2.461
0.1290073		
0.5200978	= log	3.312
0.1290073		
0.6491051	= log	4.458
0.1290073		

0.7781124	= log	5.999
0.1290073		
0.9071197	= log	8.075
0.1290073		
1.0361270	= log	10.867
0.1290073		
1.1651343	= log	14.626
0.1290073		
1.2941416	= log	19.685
0.1290073		
1.5521562	= log	35.658
0.1290073		
1.6811635	= log	47.990
0.1290073		
1.8101708	= log	64.590
0.1290073		
1.9391781	= log	86.930
0.1290073		
2.0681854	= log	117.0

Gear Ratios:

$d = 6$; therefore, according to formula 2, we have:

$$\log f = 0.1290073$$
$$d = \times\ 6$$
$$d \log f = 0.7740438$$

Ratio of back gears = 5.9435.

According to formula 3, we have

$$\log f = 0.1290073$$
$$2d = \times\ 12$$
$$2580146$$
$$1290073$$
$$2d \log f = 1.5480876$$

Ratio of triple gears = 35.325.

Machine with Two Countershaft Speeds

A complication of the problem which is sometimes met with is due to the countershaft driving the machine having two speeds. In this case we obtain double the number of otherwise obtainable speeds and this number of speeds may be expressed by $2n$. The problem is treated in the same manner as above, the factor f in this case being

$$f = \sqrt[2n-1]{\frac{b}{a}}$$

We now consider that one-half of the total obtainable speeds are due to the first overhead speed, the other half to the second.

In writing the odd number of speeds on one line, and the even number on a second line we obtain the following two series:

$a,\ af^2,\ af^4, \ldots\ldots\ldots\ldots\ldots af^{2n-4},\ af^{2n-2}.$

$af,\ af^3,\ af^5, \ldots\ldots\ldots\ldots\ldots af^{2n-3},\ af^{2n-1}.$

An examination will show that both series are geometrical progressions and that each series has the same factor, namely, f to the second power. The second series can be obtained by multiplying the first with the factor f. This means that the ratio of the two countershaft speeds must be f.

As far as obtaining the gear ratios of the machine itself, we need concern ourselves with only one, and either one, of the two series.

By following the deductions given earlier in this article we find for this "two countershaft speed" problem

log of ratio of back gears = df^2
log of ratio of triple gears = $2df^2$
log of ratio of quadruple gears = $3df^2$

Example 2. Lathe with two countershaft speeds.

Proportion the speeds and find the gear ratios of a four-step cone, back geared, two speeds to countershaft.

Slowest spindle speed = 25 r.p.m.
Fastest spindle speed = 500 r.p.m.

We have: $a = 25$
$b = 500$
$2n = 2(4 \times 2) = 16$
$2n\text{-}1 = 15$
$d = 4$

$$f = \sqrt[15]{\frac{500}{25}} = \sqrt[15]{20}$$

$$\log 20 = 1.3010300$$
$$\log f = \tfrac{1}{15} \log 20 = 0.08673533$$
$$f = 1.2210$$

In following out the calculation as shown in example 1 we obtain the series of 16 speeds given below:

1. 25.	5. 55.58	9. 123.54	13. 274.64
2. 30.53	6. 67.86	10. 150.85	14. 335.35
3. 37.28	7. 82.86	11. 184.20	15. 409.48
4. 45.51	8. 101.18	12. 224.92	16. 500.

Dividing the Speeds Between the Two Countershaft Ratios

Of these 16 speeds, eight are due to one countershaft speed, the other eight to the second countershaft speed. We write the odd and even speeds in two series, as below:

First series	Second series
1. 25.	2. 30.53
3. 37.28	4. 45.51
5. 55.58	6. 67.86
7. 82.86	8. 101.18
9. 123.54	10. 150.85
11. 184.20	12. 224.92
13. 274.64	14. 335.35
15. 409.48	16. 500.

The log of ratio of back gears as explained above is df^2

$$\log f = 0.08673533$$
$$\times\ 2$$
$$\log f^2 = 0.17347066$$
$$d = \times\ 4$$
$$\log df^2 = 0.69388264$$

Ratio of back gears = 4.9418

Ratio of countershaft speeds = f = 1.2210.

This method of proportioning speeds in machine drives will be found, after one or two applications, a rather simple one. Its usefulness, however, is not limited to the proportioning of speeds in machine drives, as it can also be applied to the proportioning of feeds.

Some designers hold that the factor f should be held between the values of 1.18 and 1.3 for best all-round results.

Shop Paper as a Means Toward Co-operation

By PETER F. O'SHEA

What do the other men in the shop know about the difficulties of your work? Isn't it true that the things they ought to know are the things they don't know? There are certain men in the shop who could make things easier for you if they could see your side of the game. Perhaps you never even saw these men. Wouldn't you like to point out to them the particular ways in which they might use a little more care in doing the work they send on to you? The author of this article, who has had wide experience with shop papers, answers these and other questions from his point of view.

I SUPPOSE every shop man has at some time wanted to have the rest of the men in the shop looking over his shoulder some day when all the difficulties incident to his work come pouring in upon him. How many times have you said, "Huh! If you don't believe I earn my pay, I'd like to have you follow me through a day's work. You'd drop dead just from looking at it, boy!"?

Well, why don't you? Did it ever occur to you that you might easily tell all this in your shop paper, if your shop has one?

What you do for the plant. Just where you fit in with the rest of the men. Why you and your job are necessary to the rest of the shop. Tell the value of the work you do, the details, and the funny side of it all.

On the other hand, make a mental list of the men in the shop or the office. You would like to be shown why these other men are necessary, how they are of service to you, how they fit in with you, and how they go at their work, which is different from yours.

If your shop paper has not a live, interesting, and worth while "coöperation" column, why don't you give it a start by contributing an article about your work?

If you haven't a shop paper, why hasn't one been started? I venture to predict that the management will be willing to pay the expenses of a live, interesting shop monthly appealing to men with brains and a sense of humor. They will find it valuable.

There are plenty of papers about parts of your work—the *American Machinist*, the trade papers, the management magazines, etc. and there should be a paper about the work and the people of your shop.

What a Shop Paper Should Be

The shop paper should be full of items about the people in the plant, of news, of information, and of all the thousand things that a man would like to see in print about his plant and his work.

The employees—and employees includes the president—of a modern shop will find a good paper so interesting that they will read it thoroughly—which after all is the best compliment to any paper. Why shouldn't they read it? It is their own particular paper, about themselves and their activities.

In the modern factory, cut up by walls into isolated departments, the manager and the workman often feel the need of closer union. Nowadays each man is only a piece of a workman. The other pieces are the men who do the rest of the processes, and who may be out of sight and out of mind.

To get the best results we must bring back at least a mental reunion. We should have a spirit of unity, a personal acquaintance of each man with the rest of the shop.

The shop magazine is put into the hands of all on the same day. It overcomes distance, impersonality, and walls.

The most obvious coöperation "story" for printing in the shop paper is a description of the chain of processes in the manufacture of a product. But it should not be treated in a dry way. We should apply the principle of making everything personal. Instead of detailing the mechanical processes only, treat the subject as a chain of people, each preparing or completing the work of the other men in the chain.

Suppose the individual workman finds his name and job in the shop paper in an article on the making of a

certain product. He sees in the article all the preceding and succeeding processes on the same product, as done by workmen who are designated by name just like himself. These other fellows do not even differ from him by the product they are working on, but simply by the particular process each one does on that product.

The Workman's Impulse Toward Coöperation

The average workman's first real impulse toward coöperation comes from the realization that other work as well as his own involves not simply the company's interest but the human interest of another workman. It is brought home to him that such and such a man has an interest in receiving his work in shape so that he can do the next process quickly and correctly. Possibly he has never before been told the chain of processes in making his product. Certainly he has never seen it in print in human terms. Print has a strange power over the human mind.

In each article, put in a little conversation or dialogue. Refer to amusing "Kinks" in the work. Some of the men in the chain should be mentioned by name—not all of them: pick out those who have been longest on that particular job so that the others on the same process may regard the man mentioned as only typical of themselves.

We should have plenty of pictures in the shop paper

and the subjects of these pictures should be scattered at salient points along the chain of processes, all the way from the raw material to the finished product.

The story should be told interestingly in the text, where there is a chance for humor, but the photographs should give visual proof of the story. Names of all men in the pictures should be given below them.

Occasionally a product should be selected for description, which during the course of manufacture passes through not one but two or three plants of the company, if there are more than one. This brings home the essential unity of the whole company.

The Story of a Plant

How would you go to work to describe your plant?

Starting in the office, the story should note the classification and distribution of orders, then dividing with the work, follow through its main parallel channels in the shop to meet again at the shipping room door.

The photographs follow the same procedure.

In writing about the work of strictly service departments—that is, departments making tools or accessories or doing repairs, etc., for other departments of the company—the story should include a description of the use of such products by the other plants. This shows that the department is of service and brings out once more the fact that the production plant is of service to it by being its customer and finishing its final production work.

At least one photograph should show the product of the service department in use in another department or plant. In demonstrating the value and the work of the toolroom, for instance, a photograph of one of the fixtures attached to a production machine in another department, with a workman turning out quantity product on it, is indispensable.

Always it is men that the shop reader is interested in—men with two hands and a vocabulary of cuss words and a family at home, men who at work are interested in their work, and will use the cuss words about it if it goes wrong. When you get a shop reader thinking in human terms you have him on the point of offering to coöperate in any way he fits in.

Any man can write about his own work. Writing is a matter of knowing your subject, and has very little to do with a pencil or a typewriter or with grammar. So why not pick out the instructive and most interesting part of your view of your work and make it an interesting subject in the shop organ where it belongs?

What to Tell

Nothing said here means to have a man tell all his troubles. Let him tell a few, provided he laughs at them. As a matter of fact, no man will want to "whine" in a publication that is going to be read by the men around him. But turn him loose on his professional pride. Let the writer show of what value his product is, why he has to be careful with his work, and why he desires other people to be careful with the work that is coming up to him.

Some shop magazines proceed on the policy that they must make people forget their work. That is pitiful. What they ought to do, and most of them try to do it to a limited extent, is to show the shop readers their own work and how it is done.

Brevity of descriptions is a great help to getting an article read. So is simplicity. Avoid so-called technical terms understood only by the men in one room. The articles are to be read by foremen and by office people, and men in other departments. It is quite easy to select terms of description or comparison which will readily be understood by a wide circle.

We cannot insist too strongly on humor, human nature, and personal interest in these articles. Wherever there is a chance to avoid making a dry statement, bring out the same idea humorously. It doesn't take a humorist to do this. Any man knows the humor of his job as well as he knows the work of it.

A Trip Through the Shop

It is impossible to take the whole shop for a trip through its various departments in fact, but it is quite convenient to do this on paper. I have had men say to me that a fellow working in one room always thought the fellow in another room had a better job than he had. "I suppose the other chap must work," one young fellow told me, "but I don't know he works—I never saw him work. If I could go in and see him working, then I'd know that he worked. Another thing, I'd probably find by looking at him that he could do his job better and faster than I could. I'd be interested in his work, and I'd wish him luck at it. So I'd be satisfied to go back to my own job that I can do pretty well myself."

When a man has thus come into contact with a great many men in the shop paper he gets a notion of the inter-working of the factory team. He realizes definitely the need of a captain for the team. He asks himself, "Where would I be if we didn't have a manager to tie us all together at the right time?" In other words, you have sold him management. And you have sold it to him in the best possible way, by creating a demand from him for it.

For he has arrived at the understanding of management, not as a "cinch" position, but as a job of work that has to be done by a man who has his hands full and his head level. When he comprehends management as a necessary day's work, full of human worry and effort, and sees its important relation to what all the other men in the plant are trying to do, he will disclaim any intention of putting obstacles in its way and will be ready to help. From that moment you have an increase in voluntary intelligent obedience to the management.

Appealing to the Workers

Every man would rather have his work intelligent, straightforward, efficient, and civilized, with a certain pleasure in the decency and the efficacy of it.

Can the workers in a plant actually be reached by the appeal of such ideas?

Every workman has a professional pride, even if it is only a germ, which can be aroused. There is also a pride of team work. It is exemplified most strongly in the members of a big league base ball-team, each working not for himself, but to fit into the swift clock work which ends at a base.

All that is necessary is to give the man an opportunity to show himself and others what he does and where he is of interest and importance to others.

The idea of team work can certainly be built up through the house organ.

The shop magazine should show to the people in the shop that the people in the office are of value to them. The men in the shop will be glad to find out that they aren't having something put over on them, that the white-collared chaps in the office really do have

to work for their pay envelopes as well as themselves.

Furthermore, an explanation of the fundamental value of costs, accounting, routing, etc., to the shop, expressed in simplified terms will make the shop less impatient with the red tape of blank forms and other tools of office functions. If you put it up to any foreman whether he would rather do his own book-keeping complete, or do it only in skeleton on a few blank forms for somebody else to work up, he will see the matter in a new light.

The office departments which have no routine intercourse with the shop departments are in most danger of appearing to the shop to be useless appendages. It is of course easy to prove that they are service depart-

ments for the plant. It is for the interests of the whole company that such proof of the purpose and the work of such departments be presented.

Why should the manager of the company be willing to pay the expenses of a shop paper?

Because it helps him in running the shop. It makes his men more intelligent, more educated in the processes, purposes, and problems of the shop. It is easier to deal with intelligent men who know something beyond their own machines.

The shop magazine has nothing to do with labor troubles. It is not affected by either closed shop or an open shop. It is appropriate under any management system, staff, line, or committee, with shop committees or without them. It is simply and always a means to make work in the plant easier, more intelligent and more pleasant.

Helpful to the Management

The manager may do his work well from the top, but he finds it difficult to stir up a force from the bottom. His function is not only to control the force that comes up to him from the organization, but it is also to reach down into the organization and there set free and arouse more of the potential force of the factory so that additional energy will come up to him and be available for control. Modern management demands more and more attention to the personal element of the factory and the best way for the manager to reach every man in the shop is through a shop publication.

Our magazine must be the employees'. The manager pays for it. That is all he does. He should desire, both as a gentlemen and as a wise manager, that the employees forget the matter of payment as soon as possible. In other words, the manager buys the ticket then he gets off the train. He does just the same thing for a salesman. No manager, just because he pays the fare of one of his salesmen, would think it necessary to do the traveling also. The shop paper is a salesman which the manager sends traveling in his factory.

We have seen that the most efficient way to get at things is from the bottom, from the employee's point of view. Then build upward. The manager knows all the parts of his plant. He is not trying to instruct himself. He is only giving the employees the means to become interested in each other and in the plant in which they spend their lives. So the assistant editors should be employees, the news gatherers and contributors and illustrators should be employees, who are working at their own daily jobs. If the company is a large one it will require an editor who has no other job but editing the paper. But he must have the employee's point of view. He must consider himself the composite employee. He must also of course have ultimately, in the back of his head, the manager's point of view. But the two are not inconsistent. For the composite employee includes particularly the manager, who is the leader of the team. As a matter of fact the manager is a composite employee. It must be constantly remembered that things which are good for the whole team are good for the individual employees as well as the manager.

Make everything constructive. This accords with our purpose of coöperation and unity. Make everything readable in subject, style and length. There is no use in printing what won't be read. You can't follow the employee into his home and stand over him with a club until he wades through a long, dry article. The paper must carry inside itself the attraction which will draw him through it. Your magazine must be a self-starter.

Make everything personal to some men, group of men, or class of men in the plant. Shop people are interested in people.

There are a great many highly valuable and interesting things that the employees' magazine could not use, though they might be good for *Snappy Stories*, or the *Review of Reviews*, or *Harper's Magazine*. If Rudyard Kipling offered you a new story like "The Light That Failed," you would have to catch your breath in pleasant surprise and at the same time look around for some way to refuse. You might get a happy inspiration and put to him the test question. "Is it about our shop?" "No, of course not, I never heard of your shop." "Then I am sorry, Rudyard; it pains me more than it does you to reject your manuscript. For the company hasn't got the money, the editor hasn't the space, and the employees haven't interest for anything that isn't about the greatest topic on earth—themselves."

Special Machinery in the Future

By Entropy

If the old saying that necessity is the mother of invention is still true there appears to be a flood of invention directly ahead of us. Labor costs are so high that a very ineffective automatic machine is cheaper than man power. If the work done by a man who draws a couple of thousand dollars a year, can be anywhere nearly duplicated by a machine, we can afford to spend anywhere from two to ten thousand dollars for it depending on how long it will remain in use, and this in turn depends on not only its wearing qualities, but

on how long its product can be kept on the market profitably without changes which will throw the machine out of commission. It may be that this rush of high wages will prove to be a great blessing instead of the curse that it now seems to be. We have always been an inventive nation, but we seem to need an economic pressure to make us invent. We do not invent for the fun of it. It may seem so from a perusal of the Patent Office Gazette, but almost everything there, is there because of a real or fancied economic pressure on the investor's pocketbook or his stomach.

Just what evolutions in the machinist's business is this going to bring about? One thing seems likely, and that is that more special-purpose machines will be built; another is that we will settle into more stabilized lines. The economy which results from manufacturing any given thing in a few sets, and large lots, and for a long time without change, is something almost too stupendous to believe. The fact that a given machine can be manufactured safely for ten years without the change of a line of its design, enables the manufacturer to buy stock to advantage, build special machines to dispense with help, and to put parts through in large lots, enabling him to hire low-priced help to break in on the job.

Will this affect methods in the shops building machine tools with which to build machines for production? Probably not in the same way. The product of machine-tool shops will probably be more varied; they will not be able to take advantage of the specializing which their customers' customers will do; they will likely build in even smaller lots, and vary designs a great deal more. It is almost safe to predict that a great many machines which are built now in quantities, such as lathes, milling machines, etc., will be built with more variations and attachments. The big point is going to be the necessity for making the product of the machine that is made by means of machine tools cheap. That is, the point of greatest economy is needed in the second remove from the machine-tool shop. Machine tools can cost much money, and the machines which are built, such as looms, steel mills, farm machinery and so on, by the use of machine tools can cost a great deal so long as they are efficient in making fewer men necessary in the shops and factories in which they are used.

Evolution Is Too Slow

It is in the design of these last machines that scientific investigation must have its place. Evolution is too slow. We have built lathes for the past 50 years by adding a sixteenth of an inch to the size of the spindle every few years. We do not know how many more sixteenths should be added to make the best lathes. We do know that every particle of increased weight and size costs money, and we wonder if the market will stand it. There is danger in getting ahead of the times, but the danger is not very great if there is a good sales department. The public can be educated. It costs money to do it but the rewards are correspondingly large.

There will still be the need of all-roundness in machine tools because of the very fact that they will be so much more used to build special machinery, and that that special machinery will be made in such small lots. Machine-tool shops will need not only all-round equipment but all-round men. Before the war machine-tool shops were not famous for liberal wage rates. Their men were rapidly absorbed by the automobile manufacturers and they were running with a few good men who were reluctant to leave old jobs for new, and a large mixture of men who were anything but machinists. Machine-tool manufacturers will have to maintain their prices high enough to enable them to hold a good organization, even if that means paying the highest rates of any machine shops. Maintenance of prices is only a matter of education, both of competitors and of customers. Prices would have to go several times as high as they are now before it would pay manufacturers to run small shops of their own, building their own tools with which to build their own machinery. Charging all the traffic will bear for machine tools is not politic but there is a large margin between that price and the present, enough at least to justify the retention of sufficient capable mechanics to do the work well and efficiently.

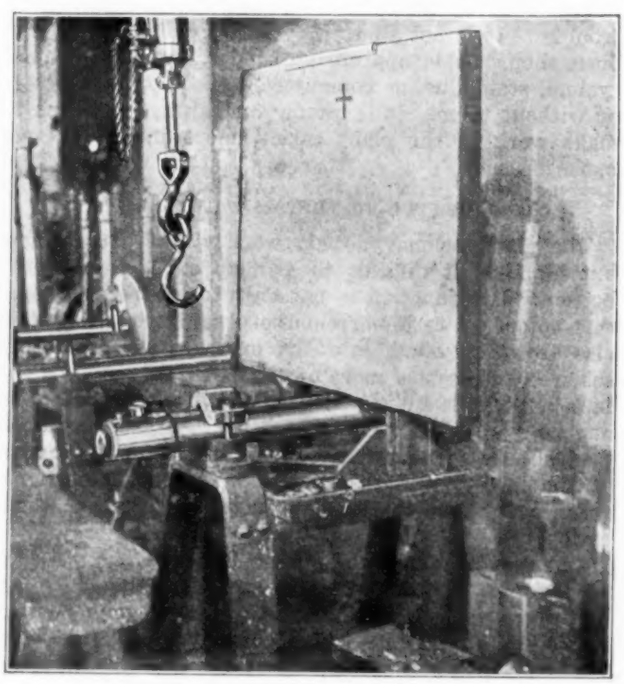
It is almost safe to predict that machine-tool shops will have to come more nearly to being engineering establishments, which instead of building machinery by the mile, and telling their customers to take them or leave them, will prescribe for their clients and design the machinery best adapted to the purpose for which it is to be used.

Safety First

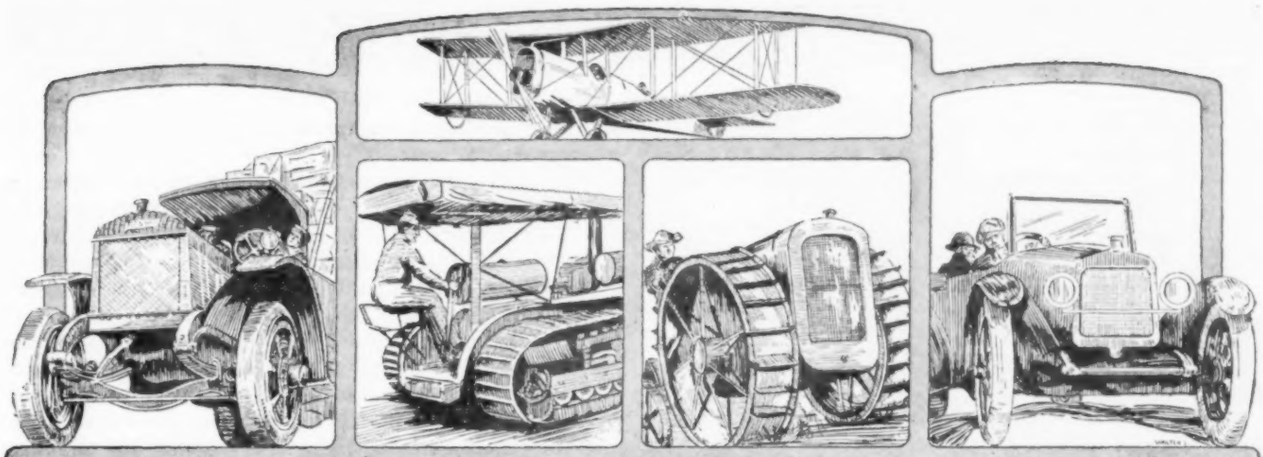
By Charles Maxwell

The illustration shows a screen used in the Chicago shops of the Chicago & Northwestern R.R., to protect workmen against injury from flying chips. The screen consists of a wooden frame covered with light sheet iron and on top of that a covering of burlap, or other soft material, to prevent the chips from bounding into the workman's face. It is portable and can be placed anywhere it is needed. Besides being used to protect workmen, it can be placed in front of a window to prevent chips from breaking the glass.

As illustrated, the screen is shown placed on top of a piston rod clamped in a movable stand, ready for chipping out the slot for the cross-head key.



SCREEN TO PROTECT WORKMEN FROM CHIPS



AUTOMOTIVE CONSTRUCTION

How We Make Automobile Cylinders

By FRED H. COLVIN
Principal Associate Editor, American Machinist

What is the best method of machining cylinders and other parts for automobile and similar motors? The answer depends upon such conditions as design, quantity required and the equipment available. This is the beginning of a series which will show the methods of some of the best-known builders in the United States. It begins with cylinders and will show how the different shops handle this problem.

THE manufacture of automobile cylinders in the various plants throughout the country seems to have developed certain methods, which comprise basic principles as to the operations employed and the sequence followed — particularly during the first few operations. The problem is to face the cylinder flange as squarely as possible with relation to the cored holes in the cylinder castings. Unless this is done, it becomes more difficult to bore the cylinders straight and true, owing to the difference in the amount of metal to be removed on the sides, and it also leaves a varying thickness of cylinder wall which affects the cooling as well as the strength of the cylinder block.

In the early days of automobile-motor building, a number of manufacturers, notably the Thomas Co., of Buffalo, bored the cylinders as the first operation and used the bore as a working point. The cylinders were cast in pairs and located with relation to the bore by means of targets set on the boring fixture. There was a cored hole at the top through which the targets could be sighted, and all future operations were located from the cylinder bore.

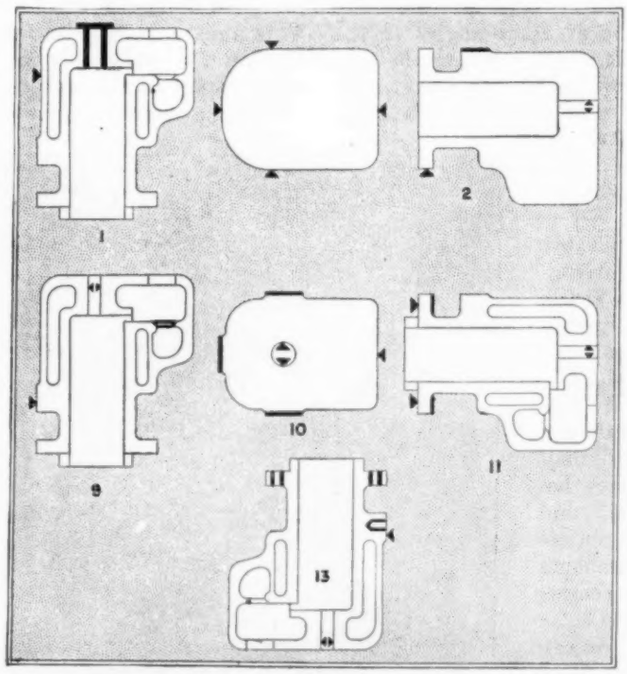


FIG. 1. THE TRANSFORMATION DIAGRAM SIMPLY GIVES A GENERAL IDEA OF THE OPERATIONS AND HOW THE WORK IS LOCATED. THE HEAVY LINES SHOW THE SURFACES MACHINED AND THE BLACK TRIANGLES THE POINTS USED FOR LOCATING OR POSITIONING

The present tendency, however, is to break away entirely from this practice, as the uniformity of the castings now obtained allow the cylinder blocks to be located quite accurately from the outside of the casting.

The exact procedure in the machining methods used in the manufacture of cylinders for automobiles varies with the design of the cylinder itself and with the quantity manufactured. This, however, does not affect the actual methods of the machining operation as much as the arrangement of the machines and the method of handling the work.

In almost every case, whether it is an individual cylinder, or cylinders cast in blocks, the first operation is to machine the lower face or flange surface on a planer type milling machine. The next operation is to drill and ream the bolt holes, using this surface and two or more of the bolt holes as locating points for all future operations. In one or two instances

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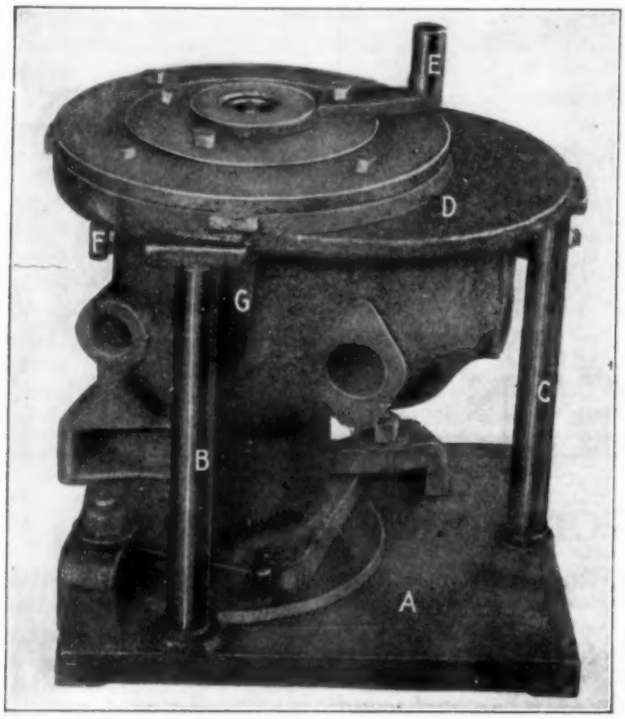


FIG. 2. FIXTURE FOR DRILLING HOLE IN TOP

this is varied by first machining the top of the cylinder and using this as a surface from which to machine the bottom flange, this applying, of course, only to cylinders having removable heads.

The main consideration is to so bore and face the cylinders that the bore will be at right angles to the base flange. This is usually done by utilizing the outside of the cylinder wall below the water jacket, and with the state of perfection now obtainable in automobile-cylinder castings, there is comparatively little difficulty with the concentricity of the cylinder bore.

In cylinders having removable heads, it is, of course, comparatively easy to so locate the cylinder that the bore will be at right angles to the flange, and by so doing, aid materially in the boring of the cylinders.

In the examples which are to follow, it will be noted that while the exact sequence of operations may vary to some extent, they have become fairly well standardized and only occasional variations are noticeable. One of the later developments is the finishing of the top of removable-head cylinders by grinding so as to insure a better joint with the cylinder head and in some few cases this is also done on the base flange of the cylinder. Grinding of the cylinder bore is almost universal although a few adhere to reaming and there is one notable example of finishing by rolling to compress the metal of the wearing surface.

The motor built by the Autocar Co. of Ardmore, Penn., has the unique distinction of being the only two-cylinder-opposed motor which has survived the test of time. The cylinders are cast singly and bolted to an offset crank case so as to connect with the two-throw crankshaft.

The first operation is to drill a $1\frac{5}{32}$-in. hole in the head, using the fixture shown in Fig. 2. This fixture consists of the baseplate *A* and three posts, two of these being shown at *B* and *C*. The cylinder is clamped in position as indicated, its exact position on the base not being especially important. Then the plate *D* is put over the cylinder so as to rest on the posts and the handle *E* closes centering fingers, two being shown at *F* and *G*, around the cylinder casting, which locates the drill bushing central with the bore. The hole thus drilled forms one of the working points for future operations.

Operation 2 mills the foot on the side of the cylinder and as can be seen, a series of fixtures are used for this purpose. The cylinder rests in a cradle and the hole just drilled fits over the plug *A*, Fig. 3. The cylinder is positioned by the level *B* so that the finished surface of the foot may be parallel with the cored opening across the side of the cylinder. The target is used for locating the open ends of the cylinder, the stop *D* being controlled by the screws *E*, while the supporting posts *FF* are controlled in a similar manner by the screws *GG*. The actual fastening of the cylinder is done by the clamp *H* and screws *I*.

The cylinder is next rough-bored and after drilling an $\frac{11}{16}$-in. hole, goes to an air test as shown in Fig. 4. This apparatus handles both the air and water testing, but as the water test is a later operation, we will again refer to this illustration later.

The device for air testing is both ingenious and

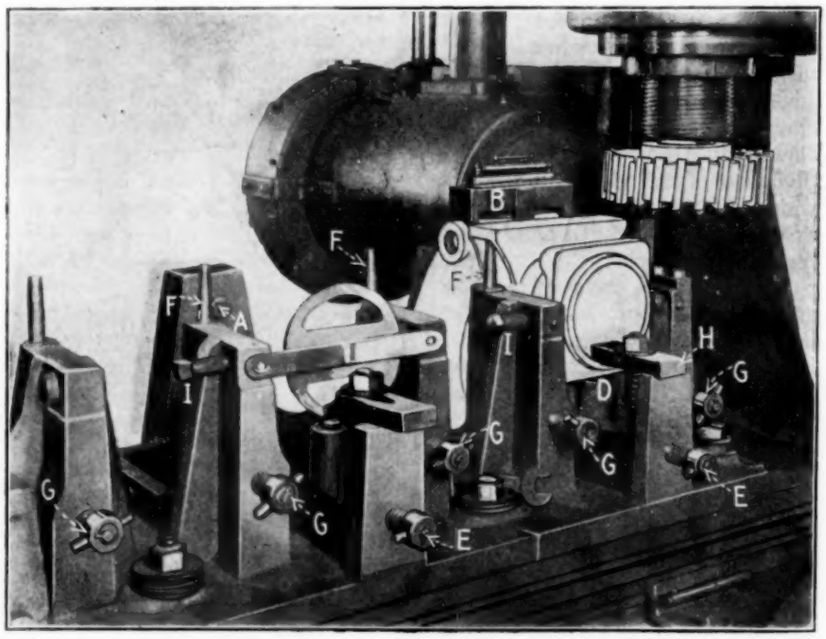


FIG. 3. MILLING FOOT ON SIDE OF CYLINDER

AUTOMOTIVE CONSTRUCTION

convenient, the work being done in the tank shown in the foreground. The cylinder to be tested, with the various openings properly capped, is placed on the rack as shown and the air hose connected. This rack is counter-balanced so as to be easily handled and the cylinder is readily submerged in the tank. At the side of the tank is a carefully hooded incandescent light which shines through a glass plate in the side and illuminates the water so that the smallest bubbles can be easily detected.

After testing, the cylinder is readily raised owing to the counter-balance and is ready to go on its way after disconnecting the air hose and removing the caps.

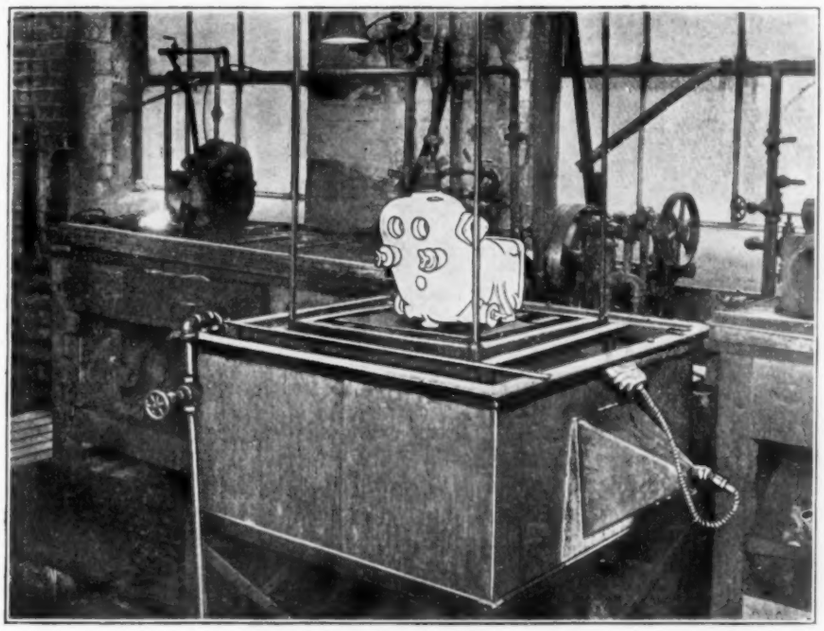


FIG. 4. AIR AND WATER TESTING

The cylinder is next annealed for 90 min. at about 900 deg. F. after which it is finished-bored, allowing 0.010 in. for grinding. The next important operation is the boring and facing of the valve seats, this being done in the fixture shown in Fig. 5. The tools used are shown on the stand beside the fixture which is shown empty in order to give a better idea of its construction. The shoulder on the crank-case end or pilot of the cylinder slips into the hole *A*, the plug *B* fits the hole at the top, while the foot on the side of the cylinder is positioned by the camshaft *C*.

The valve-seating tools are guided by the bushings in the sliding plate *D*, the plug *E* locating this slide with reference to the main fixture so that when the cylinder is moved, the bushing *F* locates the guide for the second hole. By the use of quick-changing chucks and the simple fixture shown, a very satisfactory production is secured.

The top and exhaust flanges are milled in the three-spindle machine shown in Fig. 6. This also shows the method of supporting the cylinder and of setting the cutters. The hole at the top and the foot on the side of the cylinder both center and position it, the screw *A* which fits the hole forcing the flange against the upright *B*. The wedge *C* then locates the foot of the cylinder and the supports *D* are then adjusted to support the cylinder against the cut and prevent vibration.

The cutters are set by means of the gage *E* which has three setting points; two of these are shown by *F* and *G*. The gage fits a slot in an upright of the fixture and is used in setting the cutters from the three spindles.

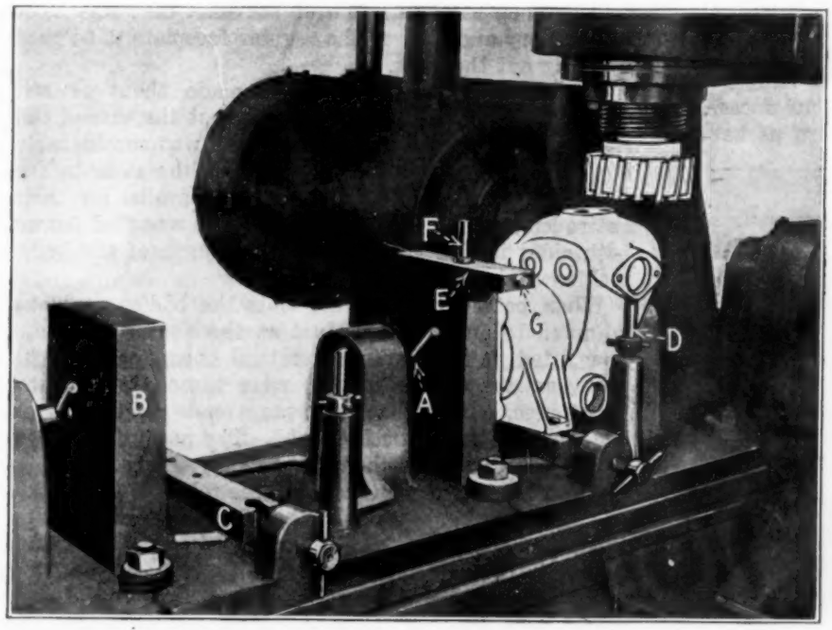
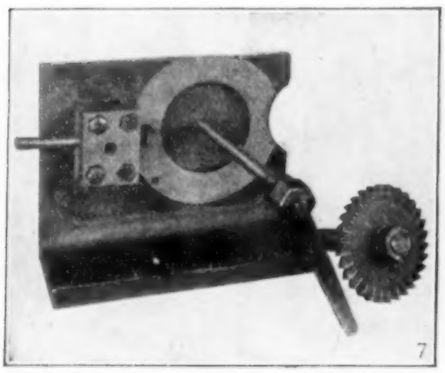


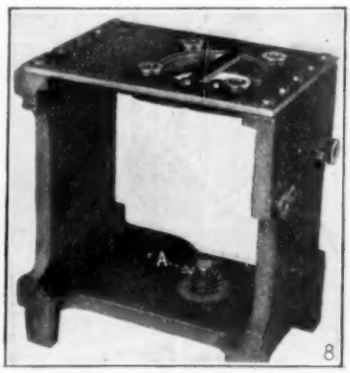
FIG. 6. MILLING OUTLET FLANGES

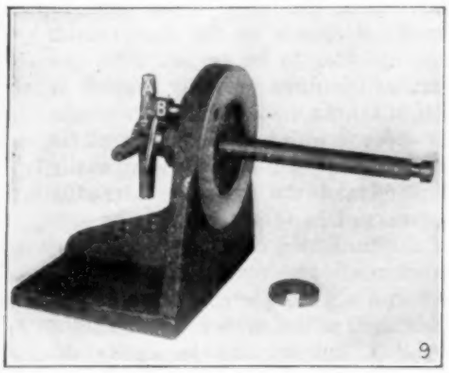
The bolt or washer seats on the back of the cylinder flange are finished by the fixture and milling cutter shown in Fig. 7. The pilot of the cylinder fits the central recess and the cylinder is held in place by the bolt shown. The V-block at the left simply locates the flange so as to bring the bolt corner in the proper position and the milling cutter backfaces the flange on a plain milling machine.

The fixture for drilling the four bolt holes in the flange and the two holes in the foot is shown in Fig. 8. Here again the pilot and the hole at the top of the cylinder are used, the plug *A* screwing into the small hole and holding the cylinder in place. The foot comes into position against the side and the six holes are then used, the drilling fixture being turned into two positions for this operation.

AUTOMOTIVE CONSTRUCTION







FIGS. 7, 8 AND 9. FIXTURES FOR DRILLING AND INDEXING

A very simple fixture for drilling other small holes in the side is shown in Fig. 9. The cylinder is simply slipped over the mandrel shown, the C-washer dropped into position and the cylinder pulled into place

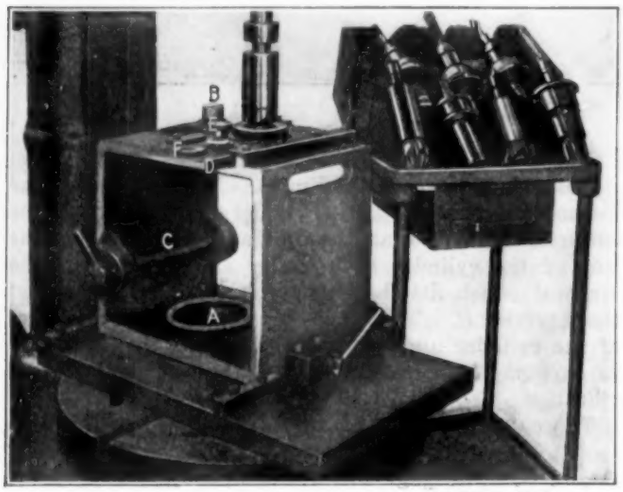


FIG. 5. FIXTURE FOR VALVE SEATS

by means of the cross-handle *A*. The cylinder can be located in four positions by means of the pin *B* which fits into any of the four bolt holes in the flange, holding the cylinder square for any of its four faces.

Then comes the water test which refers us back to Fig. 4; a cylinder being shown on the bench at the left connected for this test. An electric hand lamp is used to allow close inspection all around the cylinder to see that there is no ooze of water at any point. Grinding to finished size and inspection completes the operations on the cylinder.

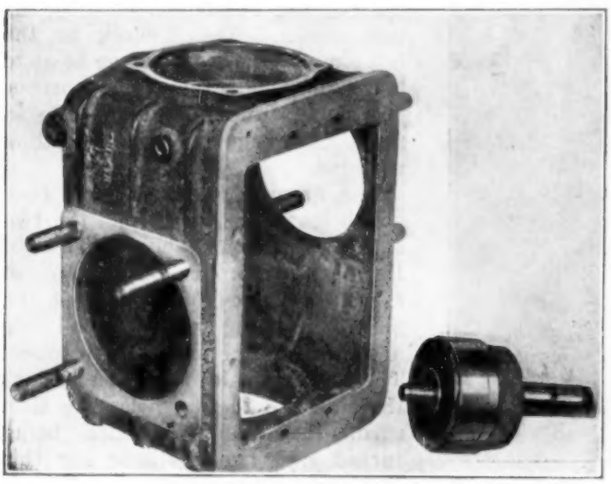


FIG. 10. CRANK CASE AND STUD DRIVER

In connection with the single opposed cylinder, it is interesting to see the type of crank case which differs so radically from that of the usual truck motor of today. This is shown in Fig. 10, the crank case being complete except for the driving of the last stud which is shown in the stud driver at the right. The crank case shows how the cylinders are offset to bring each connecting-rod in line with the two-throw crankshaft.

Canadian Substitute for a Lathe Chuck

BY W. D. FORBES

The description of "Les Poupées" by Charles Canec, on page 741, Vol. 51, of the *American Machinist* is interesting. I have seen and used these "dolls," as the words would be translated, and have found them very convenient—in some cases even more handy than a chuck.

While on a bicycle trip years ago I saw in a blacksmith's shop a modification of the idea that was most satisfactory and allowed the regular faceplate to be used by filing out the slots.

The body, or main part, was made about as Mr. Canec described the poupée, except that the turned tail was threaded on its end, and this tail was considerably larger in diameter than the width of the slots in the faceplate. These slots were filed out parallel for their entire lengths and the tail of the poupée was filed flat on both sides in line with the greater length of the body, making a nice sliding fit in the slots.

When passed through the slots the bodies could be adjusted to any position, just as the sliding jaws are now fitted to the platen of vertical boring mills. The plungers were made just as were those described by Mr. Canec, except that the square ends were solid on the plungers and were hardened. The nuts on the tails of the bodies allowed them to be firmly secured.

The man who made these poupées told me it was lack of funds that caused him to think up the design but he thought that if in making them he had counted his time in at his regular charge rates he could have bought a chuck for the amount and had he possessed the cash would have done so. Here, certainly, necessity was the mother of invention.

The Organization, System and Routine in a Phonograph-Motor Shop

By W. E. THOMPSON

There are systems of all sorts in shop organizations—systems where one man keeps every thing in his mind and from that, running the gamut up to the Taylor system. A system should be built to fit the particular shop in which it is to be used and the one requiring the least amount of clerical work, that will keep the bearings oiled and the machine running smoothly, is undoubtedly the best. In this article the author tells of a system that in many ways is semi-automatic and works well in the shop for which it was designed. Some notes of the manufacturing processes in this shop are also given together with descriptions of a few of the special tools.

THE system and methods in use at the plant of the Tiffany Motor Co., West New York, New Jersey, are worthy of description as representing efficient management of great simplicity as applied to a comparatively small plant.

The start of shop system is an organization so arranged as to divide responsibility as evenly as possible, to prevent interference between different heads of departments, and to avoid overloading any one executive. A chart representing such an organization is shown at Fig. 1. All correspondence, purchasing, sales and accounting is naturally handled by the general office and is in direct charge of the chief executive. All shipping orders are issued by the general office but stock orders and all business pertaining to production are directly under the jurisdiction of the superintendent. The timekeeper's office is located in the finished-stock room, a standard clock time-card system being used

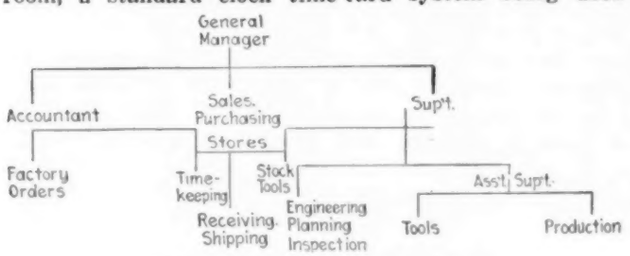


FIG. 1. ORGANIZATION CHART

to keep the elapsed time on all tasks; also all shop-production orders are issued by the stock clerk from this point.

A simple cost sheet on which is posted all labor and material charged to the job is shown in Fig. 2. These order sheets are kept in a loose-leaf file, arranged in numerical order by part number, and all time cards and material requisitions are posted each day for the day previous. Upon completion of an order the sheet is removed and turned over to the accountant to be posted and filed by part number. All material is issued on a requisition from the stockrooms to the department in which it is to be used together with a tag, a sample of which is shown at Fig. 3. This tag has the production order number, and name of part, quantity to be made, and part number on it, and remains with the

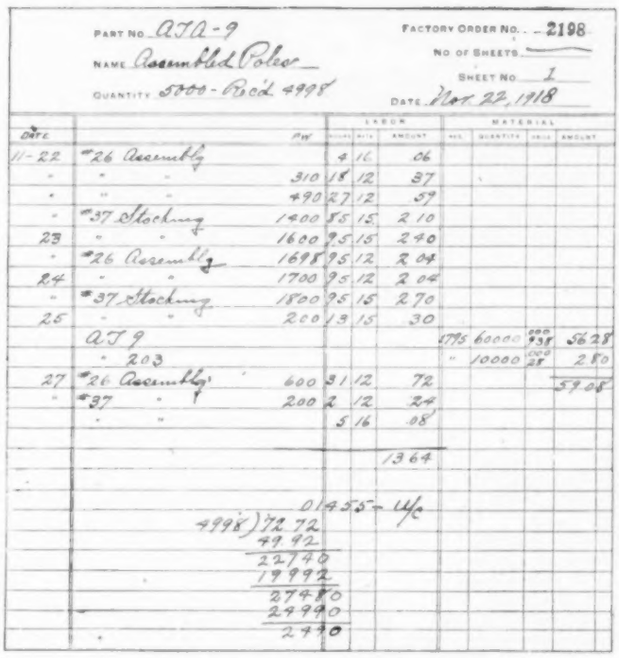


FIG. 2. THE COST SHEET

work until it reaches the finished-stock room when it is signed by an inspector, and turned over to the time clerk. A white tag is used on all regular stock orders and a red for orders that are to have precedence and these tags are referred to by all connected with the production of the parts called for by the order.

All parts are listed by symbols and numbers, and part books, a sample sheet of which is shown at Fig. 4, are distributed throughout the shop. These sheets are kept in loose holders and contain complete information regarding the part to be made, stock per 1000 pieces, specifications and operations in the proper order of procedure.

The tool crib is so arranged that all tools are convenient to the window, each tool having a listed space,

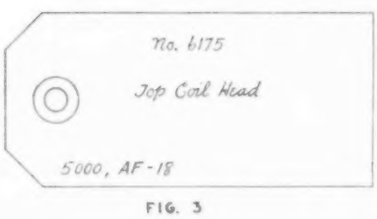


FIG. 3

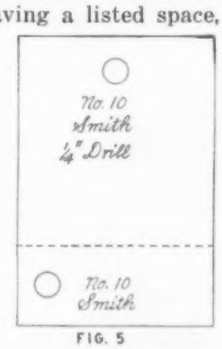


FIG. 5

FIG. 3. REQUISITION FOR MATERIAL

FIG. 5. TOOL-CHECK TAG

small tools being kept in cabinets and large tools on shelves or on a rack in the center of the room. The tag check system is used, and a tag, Fig. 5, having a perforated stub is furnished the workman who fills it out at the window or bench. The stub is torn off by

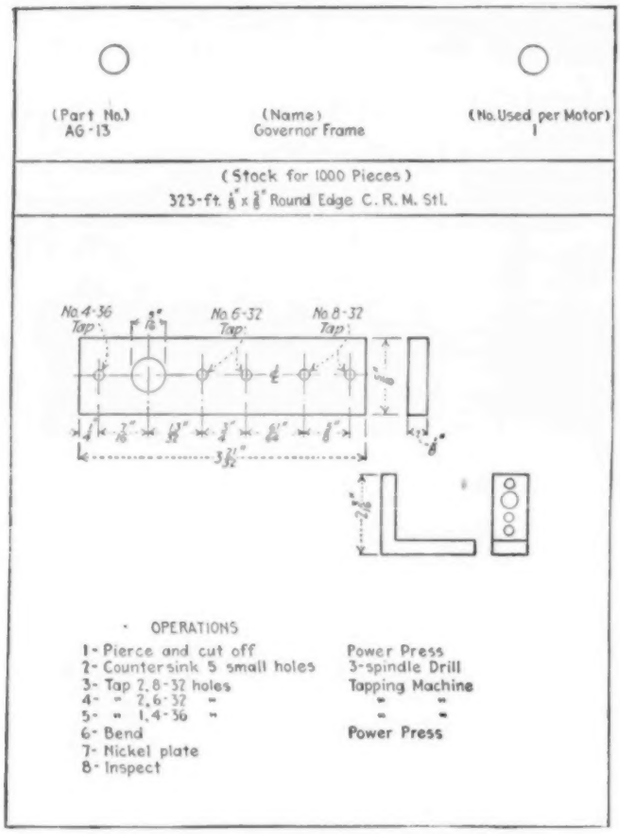


FIG. 4. SHEET FROM PARTS BOOK

the tool attendant and placed in the tool space, the large check being hung on the corresponding number on the check board. This system furnishes a cross index of all tools in use and is the most satisfactory that has come under the observation of the writer.

Storage of Finished Parts

Finished parts are stored on shelves in boxes consecutively by part numbers, the symbol and part number on the front of each box being in plain sight, and a perpetual inventory kept of each single part, sub-assembled part, or group. In some cases one part must be assembled with one or more other parts before it can be finished for stock and in this case it is listed as a sub-assembled part. Group parts are issued from finished stores as single and sub-assembled parts on an order calling for group assembly, and upon their return are stored as groups to be issued by requisition on an order for complete assembled motors; this order covers all time and material for a complete lot of motors up to shipment. Each type of motor has a letter symbol designating the general type and a letter designating parts common to one type only. In practice, on an order for AC type motors, all parts found in the A list and all parts found in the C list are requisitioned and assembled. If the order calls for AV type

FIG. 7. TRAY OF MAGNET PARTS

motors, all parts in the A and V lists are used. The motor parts are also subdivided into groups and symbolized as G-governor, F-field, etc., each group consisting of a certain number of parts that form the unit for which they are named when assembled together. Each part thus bears two symbols and a number as well as a name; for example, AF 18 part belongs in all motors having A symbol, and in the field group.

The rough-stock room is located in the basement and is in charge of the general storekeeper. All stock is issued on requisition and a perpetual inventory kept. The card used is shown at Fig. 6 and this card is equally applicable to finished or unfinished stores.

Machines and Special Tools

The machines are all grouped together by kind and all special tools for each class of machine are stored on shelves in locked cupboards convenient to each battery of machines. All tools are stamped with symbol and part number and are arranged consecutively by number. Complete sets of small tools for each part, such as foot press, or screw-machine tools, are kept in boxes of uniform size, about 6 in. x 12 in. x 6 in., with the number stamped on the end and are arranged consecutively by number. Duplicate sets of tools are made for all troublesome operations where the quantities used are large.

Part Nos.	Lbs. Per M.	Ft. Per M.	Dimensions	Material.	Name of Part.	Max.	Min.

Ordered		Received.					Issued.					On hand.		
Date	Order No.	Date	Inv. No.	Quantity	Price	Amount.	Date	Req. No.	Quantity	Price	Amount.	Quantity	Price	Amount.

FIG. 6. STOCK REQUISITION

Transportation of work from one operation to the next is done by hand tray or truck. Shallow trays, one of which is shown in Fig. 7 containing all the parts comprising the magnet group of an AU-type motor ready for assembling of various sizes, are at hand and boxes mounted on heavy castors or wheels handle the heavy parts. Parts susceptible to damage are handled in special trucks and racks, some of which are here illustrated.

The frame of the motor to which all of the parts are assembled, after preliminary inspection for defects, is tagged with a special tag shown at Fig. 8, and placed in wooden-truck racks in lots of 60 for convenient handling. Each tag has the number of the lot marked when starting and remains with the frame until the motor is ready for shipment, when the tag is removed, checked as finished on the order sheet and filed by the motor number. One of the special trucks with a lot of motors partly assembled is shown at Fig. 9.

The assembly benches are so arranged in sections

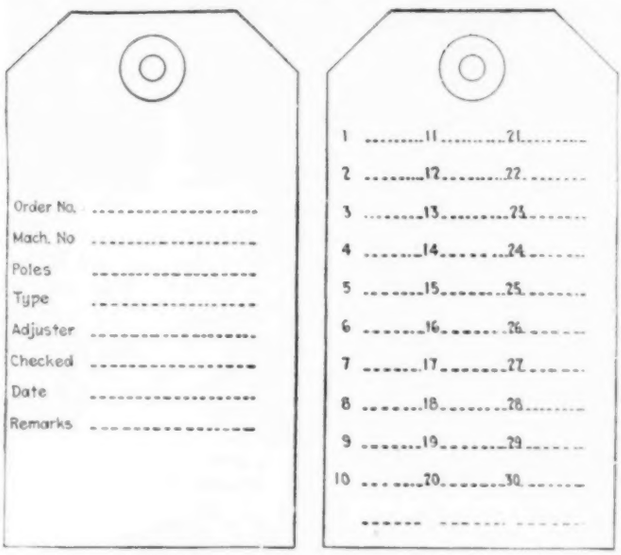


FIG. 8. MOTOR-ASSEMBLY TAG

that the different operations follow each other logically, each group assembly being complete before passing to the next. Each operator is held responsible for his work and is required to initial the tag of every motor assembled by him. Each assembly operation is divided into a series of moves, a typewritten list of which is placed before each group of operators as a means of securing uniformity and eliminating lost motion so that when the rack of frames reaches the adjusting benches all parts are complete.

The testing benches are so designed that operators work on both sides without confliction. The motors fit into racks which leave a clear open view of both bottom and top of motor at a height convenient to work. A voltmeter and ammeter are mounted on a stand, free to move about a pivot in the base, and may be moved by an operator on either side to obtain a full face view of the dials. Four insulated rods under the motor rack, having snaps for holding cable-terminals attached to them, are so connected that the motor may be instantly placed in series with a storage battery, voltmeter or ammeter by changing one terminal. For testing motors of 110 volts a.c. or 120 volts d.c., a series of receptacles are mounted on the

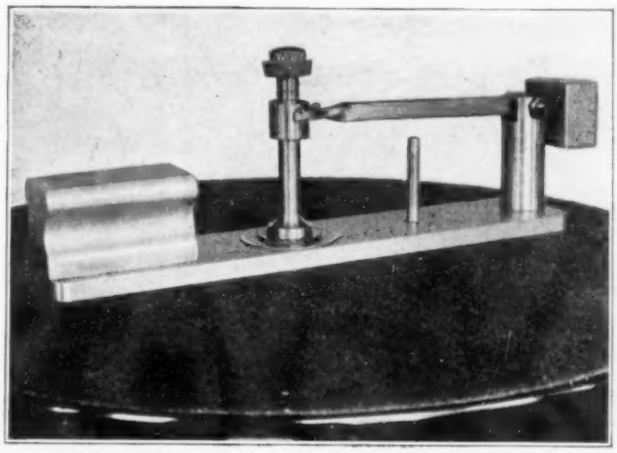


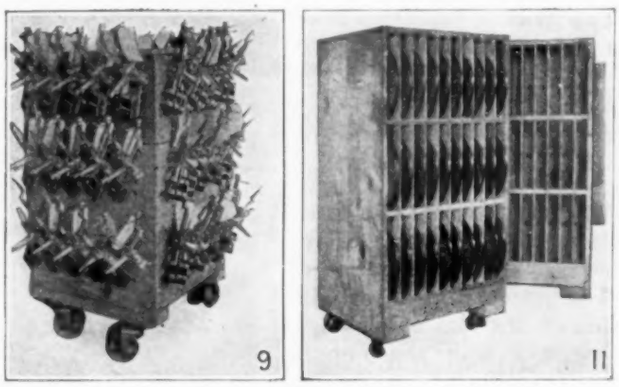
FIG. 10. SPEED INDICATOR

edge of the bench with a double-throw switch to change from one current to the other. At the top center of each bench is mounted a board on both sides of which are adjustment and inspection instructions divided into a series of consecutively numbered moves, each of which must be performed and checked against the corresponding number on the motor tag. After the motor has been finished by the adjuster, the most important points are rechecked by the head inspector who finally initials the tag.

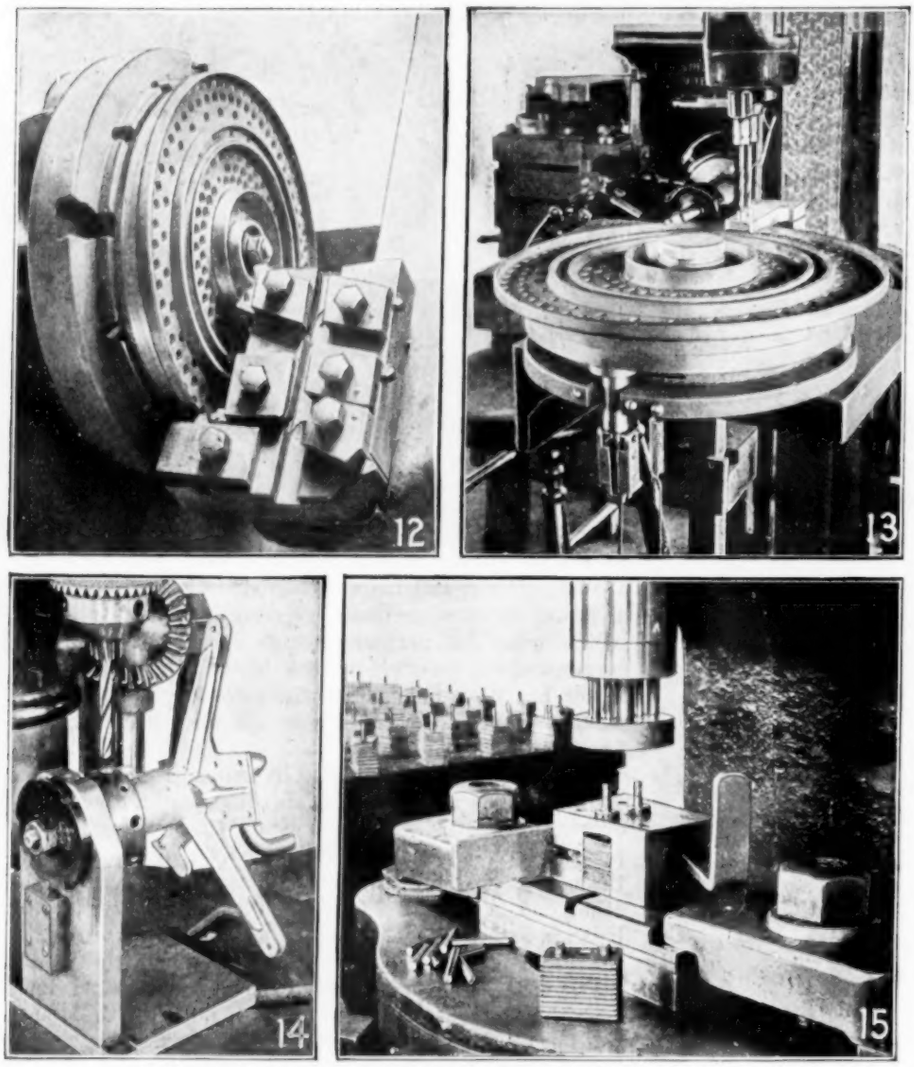
Speed regulation is checked by using the special speed indicator shown at Fig. 10. This consists of a base fitting over the turntable center nut of the phonograph; a pivoted lever at one end of which is a ring encircling the center post but not in contact with it, and at the other end, a weight. A weight for obtaining running balance and which also serves as a handle for lifting the indicator, may be seen to the left of the center post. The center post has three equally spaced lines near the top, and the lever weight is adjusted to balance the top of the ring at the center line when the motor is revolving at the desired speed.

The turntables in the rough are inspected for defects and started from the rough-stock room in the special racks shown in Fig. 11. After the center holes are drilled and reamed they are clamped on a lathe face-plate, and driven by a pin through one of the cored holes and all necessary surfaces finished in four cuts by means of the tools in the reversible multi-tool holder shown in Fig. 12.

The indexing jig shown in Fig. 13 is used in drilling 20 holes in the pole rims for locating the poles. This



FIGS. 9 AND 11. A TRUCK AND A RACK FOR PARTS
Fig. 9—Truck with partly assembled motors. Fig. 11—Rack for turntables.



FIGS. 12 TO 15. SOME OF THE TOOLS AND AN OPERATION

Fig. 12—A reversible multi-tool holder. Fig. 13—Jig for drilling pole rims. Fig. 14—An indexing jig. Fig. 15—Assembling turntable poles.

jig consists of a table having 10 hardened bushings equally spaced fitting a tapered locking pin, a foot-actuated treadle for operating the locking pin, and a two-spindle drillhead. One hand operates the indexing of the table and the other the drill spindle and a production of 50 turntables or 1000 holes per hour has been obtained with this arrangement. After the poles are assembled and all machine work finished the table is cleaned, enameled, and the felt put on.

The felt, previously cut to a specified diameter and with the center hole punched, is stretched and held in a heavy metal form, which has a depression the diameter of the finished felt and a series of phonograph needles set inside of the rim at an angle that will hold the felt in position. The turntable top is cleaned with benzine, a coat of shellac brushed on and allowed to dry just beyond the "sticky" stage, a coat of warm glue brushed over this, and the form containing the felt placed on it.

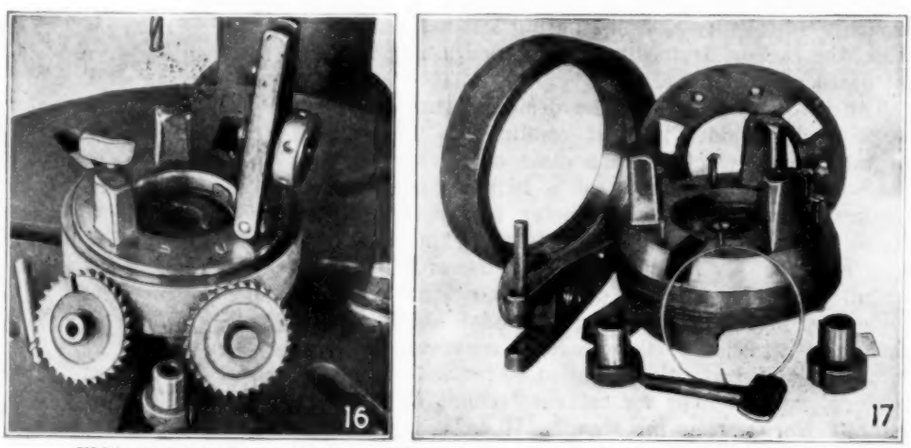
An indexing jig used in drilling screw holes in the frame is shown at Fig. 14. The frame is locked by a hand nut and can be rotated in one direction only.

The turntable poles are pierced and blanked at a rate of 3000 per hour, and assembled with pins in a foot press, as shown in Fig. 15.

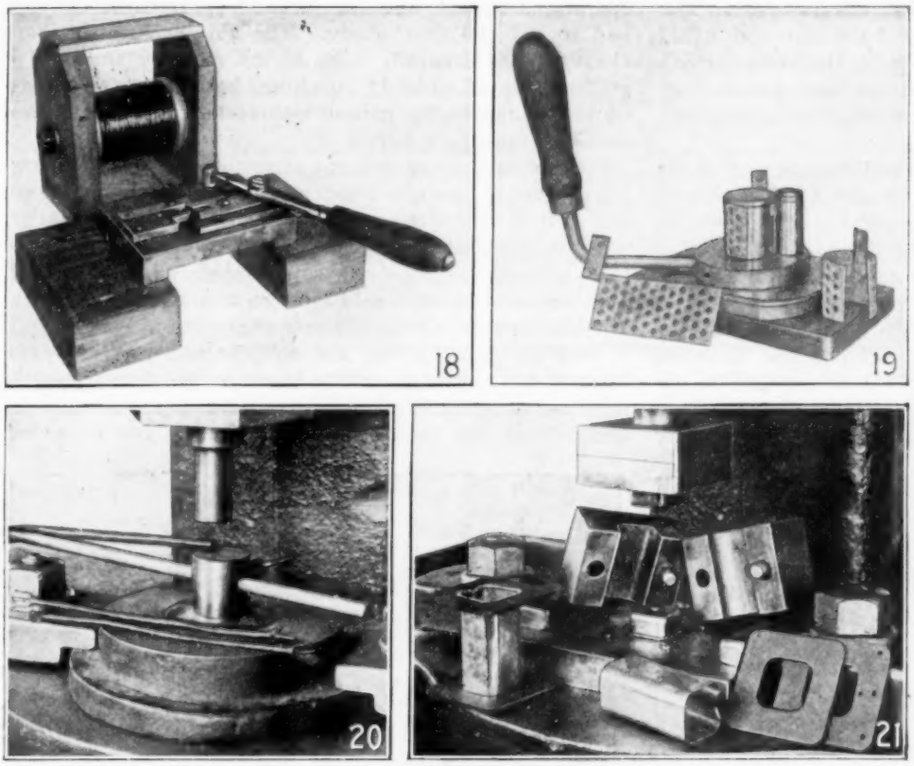
The shaft is made of drill rod and assembled with the ratchet wheel. As the teeth of the ratchet wheel are not machine-finished, and as it is necessary that the outer points of the teeth should rotate approximately true, the jig shown in Figs. 16 and 17 is used for machining the center hole. It consists of a casting having three sliding jaws, held against a tapered ring by a spring and other parts as shown. The ratchet wheel is placed in the jig and centralized by a part turn of the knurled ring; the leaf is closed and the hole drilled and reamed.

A bench tool for making wire magnet-coil connecting loops is shown at Fig. 18. The wire is fed in with one hand, cut off and bent with one movement of the hand lever and thrown out by the return movement. In Fig. 19 is shown a bench tool for roll-bending lead-condenser plates.

A number of wires are used in making the electrical connections of the motor and these have the insulation removed from a small portion for soldering. It was found that if the wire was marked or nicked with a



FIGS. 16 AND 17. A JIG FOR DRILLING AND REAMING RACHET WHEELS



FIGS. 18 TO 21. BENDING AND ASSEMBLING TOOLS

Fig. 18—Tool for bending magnet connecting loops. Fig. 19—Tool for bending condenser plates. Fig. 20—Tools for stripping insulation. Fig. 21—Tools for assembling magnet spools.

knife or sharp tool it was liable to break so a foot-press tool, Fig. 20, was made for this operation. The wire is held between two flat faces and struck just hard enough to break the insulation. The wire is slightly flattened and the insulation is easily removed by the fingers after this operation.

The magnet spools are assembled in a foot-press tool, Fig. 21. The shell, previously formed into a rectangular shape, is assembled with the core ends, inclosed in the spacing blocks and brought over the lower rolling punch. Four spring-backed pins regulate the depth of the lower flange and the press rolls and flattens both ends in one operation.

Pipe Dreams of a Tramp Machinist—The Practice of a Mystic Art

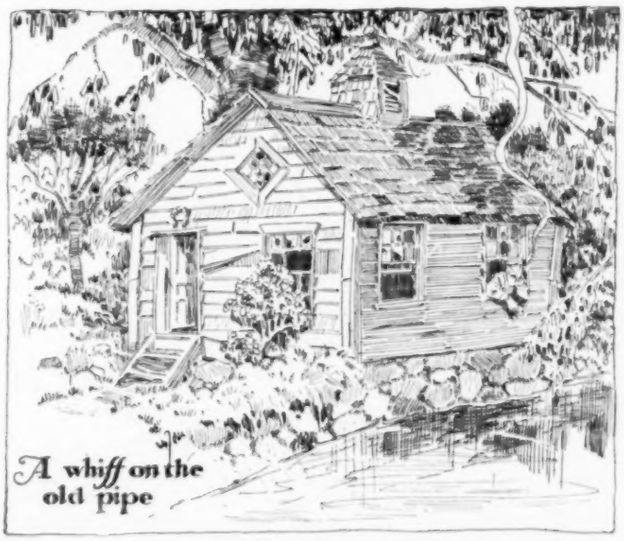
By Glenn Quharity

Under a spreading tree—not a chestnut—at the foot of the yard, with one side almost overhanging the brook, stood the little old wooden building that 30 years ago served the Brookdell Co. as a blacksmith shop; or, as we would call it in the modern language of mechanics, the heat-treating department.

There was no moving machinery in the building; the side toward the brook had two windows from which one could look out into the cool green woods or down into the equally cool, limpid water of the brook. These windows were not within range of vision from any inhabited part of the factory buildings, and therefore made an ideal spot on a hot summer morning from which to hang out and steal a few surreptitious puffs on the old pipe.

A huge stone and brick forge with a double hearth, after the manner of the old-fashioned country blacksmith shop, formed the central feature of the shop's equipment. These hearths had been, and still were, provided with bellows of wood and leather, operated by a long handle over which the "blacksmith's helper" was wont to lovingly hook his arm in the old days of strenuous toil, but at the time of which I write the regular blacksmith had passed into more or less innocuous desuetude. Each machinist forged his own tools and performed all the hardening and tempering operations required by the particular job to which he was assigned; and the wind—for the fire—was supplied through an underground conduit by a Sturtevant fan located in the machine shop. Other equipment of the shop consisted of a couple of anvils with sledges, hammers, flatters, fullers, and such, with which all blacksmiths are familiar; a foot drop for hobbing dies; and various and sundry hunks of old iron, broken pulleys, etc., not to mention numerous boxes and barrels that had once contained Heaven knows what—the 40 years' accumulation of useless oddments that will pile up in out-of-the-way corners of even the most up-to-date of factories.

Another feature of the equipment was a tub, made by sawing a barrel in half, in which cool clear spring



A whiff on the old pipe

water was constantly running summer and winter alike, while over in the corner stood a barrel of brine that when stirred up gave off the odors of the sea—a very, very Dead Sea.

Altogether this cool, quiet spot presented an agreeable contrast to the hot and noisy machine-shop in the good old summer time and, as every machinist who has worked under these conditions is well aware, one cannot be too careful of an expensive tool during heat-

treating operations at this period of the year. The charcoal fire must be carefully built up (to avoid waste, one should light one's pipe with the same match) and allowed to simmer along with the blast almost shut off while one leans one's elbows on the window-sill and communes with nature.

When the fire has at last reached exactly the right stage—a condition sometimes hastened by the boss coming out to see how things are coming—the piece is bedded in it, the blast shut entirely off and contemplation of the scenery resumed with one ear cocked toward the door in anticipation of approaching footsteps.

All too soon—dangerously soon it sometimes seems—the piece reaches hardening temperature and is fished out of the fire with poker or tongs according to its shape, and then comes the breath-catching plunge into the water. Suppose it should crack? It usually

doesn't, and with growing confidence one sits on the edge of the tub and swashes the piece gently to and fro until it is thoroughly cold.

I will not dwell upon the tempering or "drawing" as everyone who has been there knows all about heating the "draw-plate"—not too hot or the temper could not be controlled; watching with one eye the faint dawning of the irridescent colors on the polished steel while the other eye is engrossed with the equally beautiful and changeful colors in the forest, or following the fish as they dart in and out of the shadows at the rocky bottom of the stream; and the regretful sigh with which one, realizing that there is no further possible excuse for tarrying longer among such delightful surroundings, takes his way leisurely back to the machine shop and is met by the scornful query from some jealous fellow-workman: "How many ye makin'?"

In the winter it was different. There was a large open-sided "cupalo" in the roof to carry off smoke and gas, and the company had long since discontinued the practice of reglazing the windows while the time-honored custom of throwing things through them regardless of the position of the sash was still rigidly observed.

I will skip briefly over this period: There was no heat in the building except that provided by the forge fires and the language of the men. There were sometimes orgies of tool forging on mild days which required the presence of three or four men and two very large fires, but hardening and tempering were brief operations indeed, and the luckless apprentices usually had to get the fires ready. The old blacksmith shop always floats dreamily back to my memory through a golden haze of summer sunshine, bathed in the sweet odors of luxuriously garbed nature—except when I remember the brine barrel.

On one lazy, hazy autumn afternoon yours truly was busily engaged as above described in tempering a forming cutter, when out stormed George accompanied by a burst of profanity and an 8-in. drawing die. "S'matter George?" I inquired solicitously. "Gotta shrink this dam die again," said George, "this is the 'leventh time,"—George was prone to exaggeration.

Now shrinking a ring die is performed, as not everybody knows, by heating it almost to the danger point, sticking a short piece of large-sized pipe through it and rolling the pipe back and forth on the edges of

the hardening tub. The height of the water in the tub must be carefully adjusted beforehand so that as the red-hot die hangs edgewise in the tub its periphery will be submerged to a depth of a half-inch or so, thus the ring as it is rolled about by rolling the pipe is quickly surrounded by a cold band of steel, forcing the still heated interior toward the center as it cools. It is possible in this way to close an 8-in. die as much as ¼ in. by repeated shrinkings, but the limit is usually set by the breaking of the die either in hardening or in service.

George, for reasons for which he was not wholly blameless, was shrinking this die for about the third time instead of the "'leventh." He built up a roaring fire on the hearth opposite the one I was using, bedded down the die, and almost recovered his good humor while waiting for it to heat. Trouble in the shrinking and subsequent hardening however "got his goat" again, and when he finally laid the now glass-hard ring on the corner of the hearth he was fit to eat wire nails. He raised his hands above his head and waving them about after the manner of a conjuror he said solemnly, "I hope to ——, that the —— —— —— thing *busts!*"

Simultaneously with the word "busts," there was a report like the crack of a rifle and the corner of the hearth where the ring had rested was vacant. No one saw the ring leave and no one has since seen the pieces. It was the neatest, completest, most successful piece of legerdemain I ever saw.

ARMY ORDNANCE NEWS

Machining Problems Solved in Gun Making—III

By J. V. HUNTER, Western Editor *American Machinist*

The art of gun making has never required extensive machine-tool development until the last few years; consequently, machine tools adapted to all its requirements have not been made as standard lines. The lack of these has led to the design of special tools for this purpose, some of which are described in this article.

FOR slotting out the threaded sector of the breech a special swing shaping machine, Fig. 36, has been devised at the Northwestern Ordnance Co.'s plant, using a standard 16-in. Cincinnati shaping machine fitted to the heavy cast-iron bed *A* with the necessary pedestals for carrying the gun body. The toolhead of the ram was removed and fitted with a special pivoted swinging arm *A*, Fig. 37, carrying the cast-iron toolhead *B*, which is hinged on the hinge-pin hole of the breech. As thus arranged the tool will swing from the exact center of the breech block and the cut made by it will have the correct radius for clearance. In order to reach the four clearance sectors of the breech the tool *C* is revolved by a center spindle carried in the casting *B*, which is rotated by a worm-gear feed driven by the handle *D*.

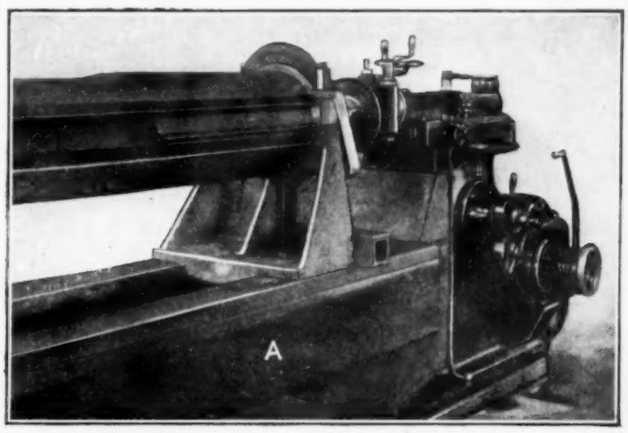


FIG. 36. SPECIAL GUN-HOLDING FIXTURE FOR SWING SHAPING MACHINE

For finishing the extractor hole the vertical slotting device *A*, Fig. 38, was purchased and fitted on the table *B* and vertical column *C* in the Gisholt shops. The base of this column is attached to the heavy cast-iron bed *D* which supports the gun body. An electric motor mounted on the device furnishes power through a chain drive to the crankshaft. All feed is by hand, the wheel *E* advancing the carriage across the table and the wheel *F* feeding the saddle.

A Dill vertical slotting machine, Fig. 39, has been fitted with a special carriage *A* and trunnion *B* for holding the gun body at the required angle during some finishing operations on the extractor hole. The trunnion moves right and left with the exact movement of the table and is controlled by chain drive from the sprocket wheel *C* mounted directly on the hand-feed shaft of the cross-movement of the table.

A method of using a planing machine for obtaining

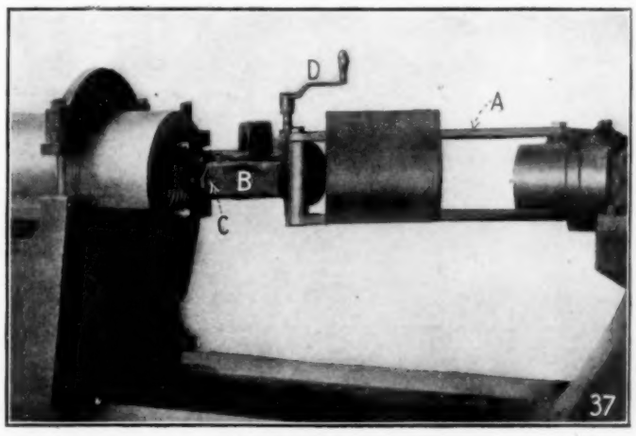


FIG. 37. TOOL AND SWING ARM FITTED ON SHAPING MACHINE

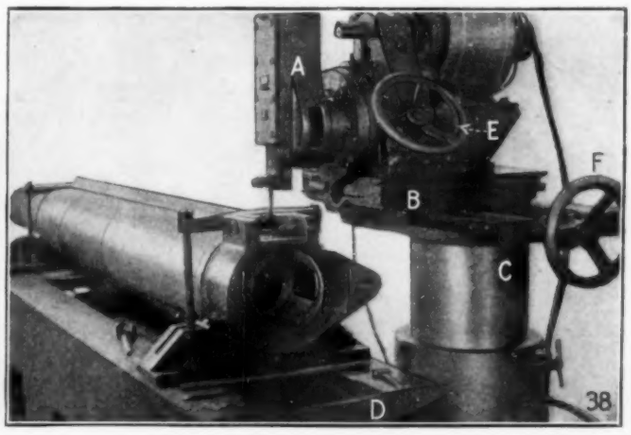


FIG. 38. SPECIAL SLOTTING MACHINE FOR FINISHING EXTRACTOR HOLE

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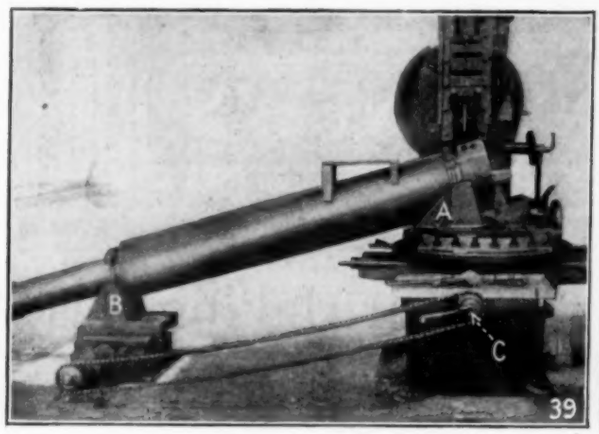


FIG. 39. INCLINED CARRIAGE FOR ANGLE WORK ON VERTICAL SLOTTING MACHINE

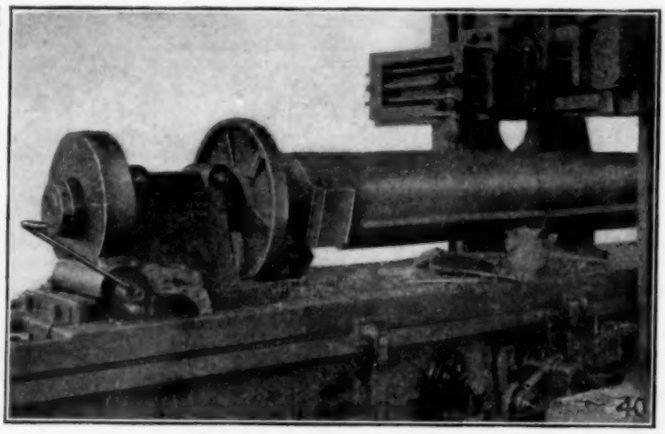


FIG. 40. ROTATING GUN TO PLANE A CYLINDRICAL CONTOUR

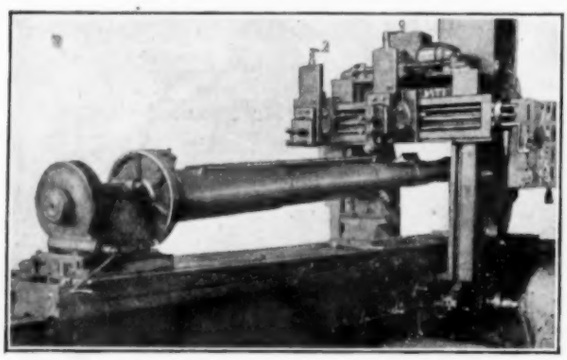


FIG. 41. PLANING A CONICAL SECTION ON LOCKING HOOP

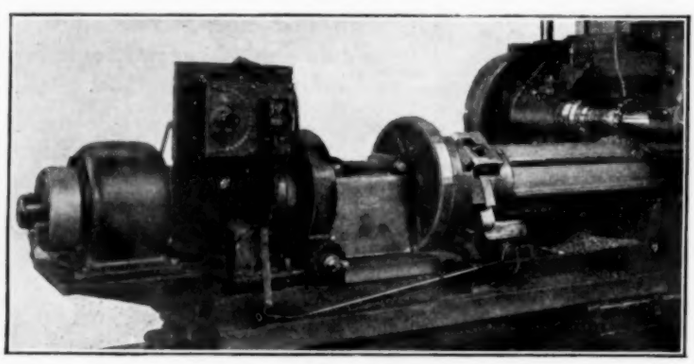


FIG. 42. MOTOR-DRIVEN INDEXING HEAD FOR MILLING OPERATION

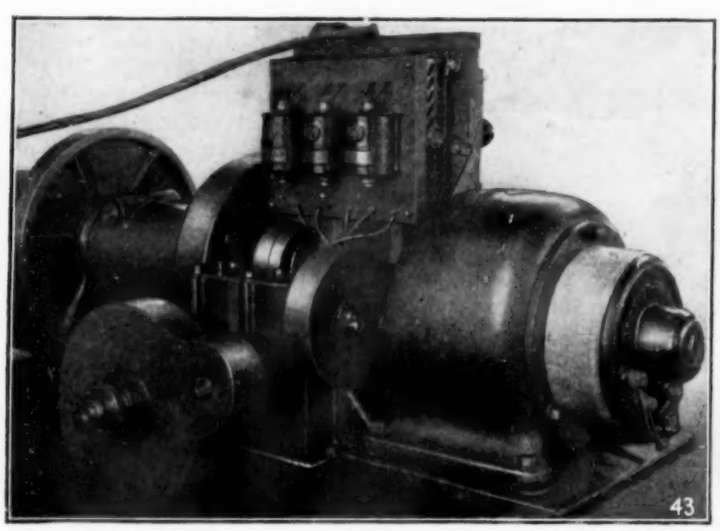
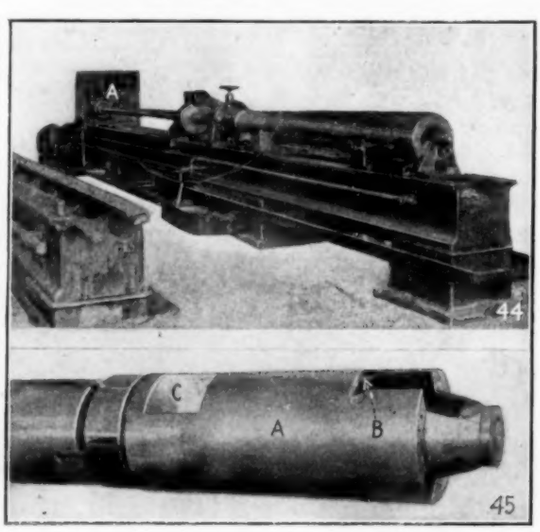


FIG. 43. GEAR-DRIVE ARRANGEMENT FROM MOTOR TO INDEXING HEAD



FIGS. 44 AND 45. RIFLING MACHINE AND RIFLING HEAD WITH GROOVE CUTTERS

a part-cylindrical contour of the gun body, Fig. 40, is accomplished by supporting one end of the gun by an indexing center and the other by a plain center. The toolhead remains stationary, and between each stroke of the table the work is given a small amount of rotary feed by the indexing center which is handled by the machinist's helper.

The same method of rotating the work is used in the formation of a conical section on the locking hoop, but it will be noticed, Fig. 41, that the gun must be inclined at an angle with reference to the horizontal bed of the planing machine.

The breech section of the body is larger than the forward end, and a space is milled around the body for relief when planing the forward section. This milling was conducted in a manner somewhat similar to the

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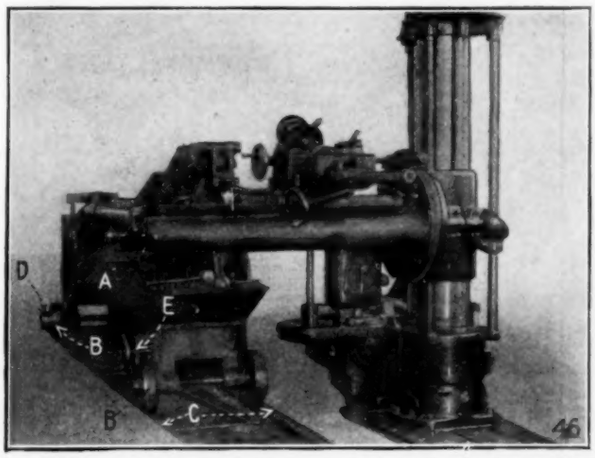

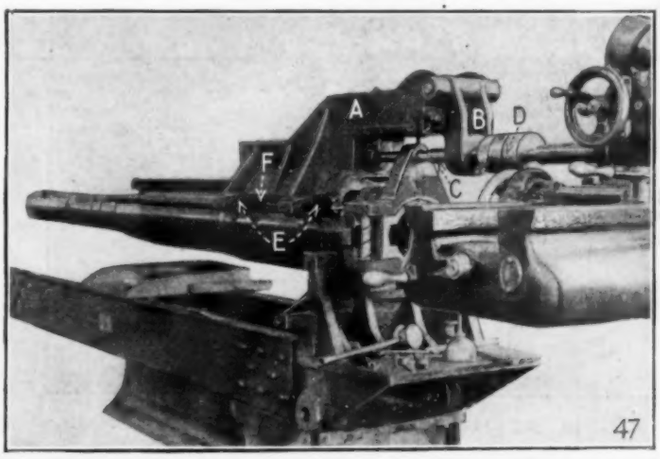

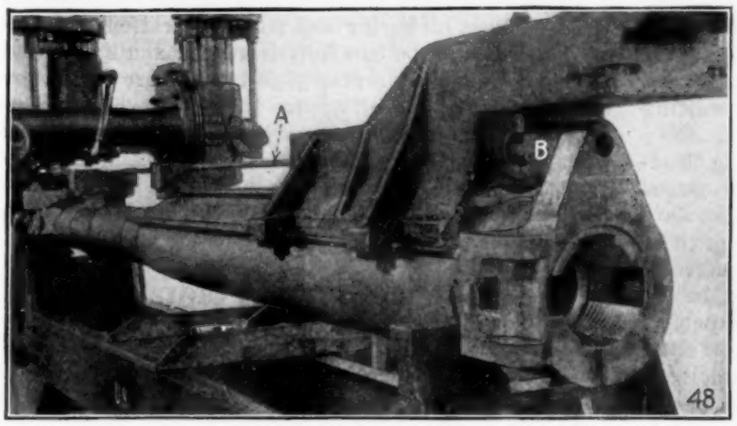

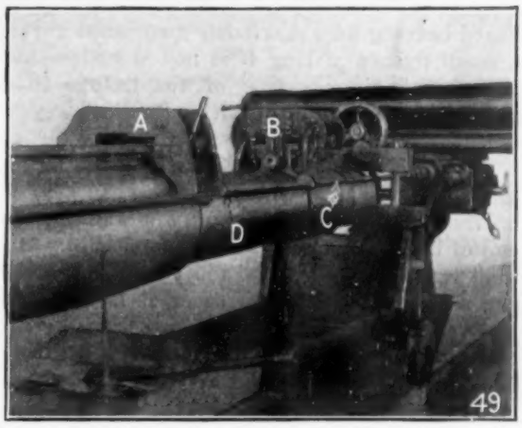

FIGS. 46 TO 49. DRILLING, BORING AND KEYWAY CUTTING

Fig. 46—Radial drilling machine with wheeled work carriage. Fig. 47—Heavy jig used for boring apron hole. Fig. 48—Keyway-cutting operation in apron hole. Fig. 49—Drilling holes in muzzle end of locking hoop

planing method just described of holding the gun between centers and rotary indexing by hand. Hand feed made this a lengthy task, so a motor-driven indexing unit was constructed, Fig. 42, which shows the work in process. The details of the motor drive are further shown in Fig. 43, which gives a general idea of the design which employs two spur-gear and two worm-gear reductions.

The Le Blond rifling machine and the rifling head, Fig. 44, are similar to the types used for this work in other parts of the country, the machine being driven by a reversing motor which is actuated by an automatic control panel *A*. The rifling head, Fig. 45, consists essentially of a heavy bronze, body shell *A*, an interior steel core which carries the three single groove-rifling cutters *B* and the necessary cone with trip movement to relieve the cutters at the end of each cutting stroke. The adjustment for setting up the cutters is available through the opening *C* in the body.

One of the interesting machine tools provided with special equipment is the Cincinnati Bickford radial drilling machine, which has a work carriage mounted on wheels, Fig. 46, so that the gun body may be passed back and forth for a variety of operations of drilling, keyseating, etc. The heavy cast-iron and structural-steel carriage *A* is mounted on the wheels *B* that run on the steel rails *C* laid parallel to the bed of the drilling machine. Since the carriage is too heavy to move easily by hand the rear axle is provided with a capstan *D*, in which the operator may insert a long bar and more readily turn over the wheels. A clamping device *E* is provided, which acts as a positive brake on one of the wheels to prevent the carriage from being moved by the thrust of the boring bars or drills.

Description of the Heavy Drilling Jig

A more detailed view of the heavy drilling jig *A*, Fig. 47, shows it mounted directly on the gun body for use in a series of the operations. It has an overhanging bolted-on arm *B* which acts as an outboard bearing for the long boring bar *C* used for boring and reaming the large hole through the breech apron. A semi-flexible coupling *D* is provided between the spindle shaft of the boring machine and the main boring bar to take care of any lack of alignment. The main body of this drilling jig is clamped by the bars *E* to the sides of the slide guides which extend lengthwise of the gun body. The flange *F* carries hardened drill bushings for small holes which pierce the slide guides.

After the apron hole is drilled and reamed a keyway is cut from the muzzle end for about half its length, and to handle this the work carriage is propelled along the track to the further side of the radial arm which has been temporarily raised for clearance, Fig. 48. The arm is then reversed and drives the keyway cutting tool through the long spindle extension shaft *A*. The out-

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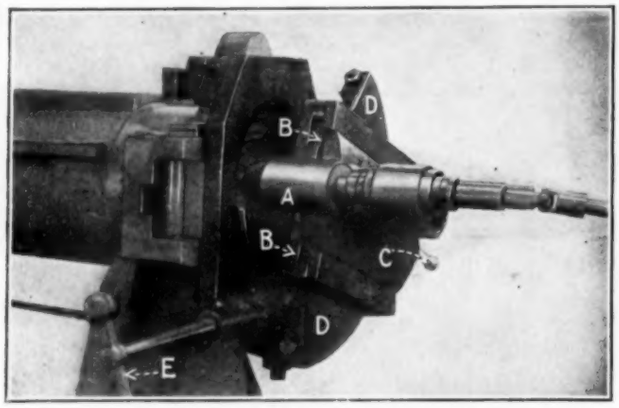


FIG. 50. ATTACHMENT FOR MILLING RECESSES IN BREECH END

board bearing arm previously mentioned is removed and a small fixture casting *B* is bolted under the inside of the overhanging portion of the fixture to carry and guide the small milling-cutter type of keyway-cutting tool.

After the apron hole is completed the large jig is removed and several smaller ones, Fig. 49, are placed on the muzzle end of the gun for drilling the forward end of the locking hoop and the front clip. One of these drill jigs *A* is supported and clamped to the flanges of the slide guides and the other *B* is made fast in the grooves of the front clip, thus assuring their perfect alignment. The long extension of the drill spindle shaft *C* is supported by the lower portion of the drill jig *B* and carries at its forward end the drill *D* which, guided by hardened bushings in the jig *A*, drills three holes in the front end of the locking hoop.

Milling Small Recesses

The milling of certain small recesses in the breech of the gun is done by the use of an attachment, Fig. 50, that fits on the face of the breech and carries a sliding and adjustable spindle arm, which is power-driven through a flexible shaft and several universal joints from a small motor. It will be noticed that the spindle arm *A* may be set forward and back, sliding in suitable ways *B* by the feed-screw handle *C* at its rear. This sliding arm may also be rotated through a limited angular distance, for which purposes it is supported by the segment *D*. Rotation is obtained by the hand drive through the feed-screw handle *E*.

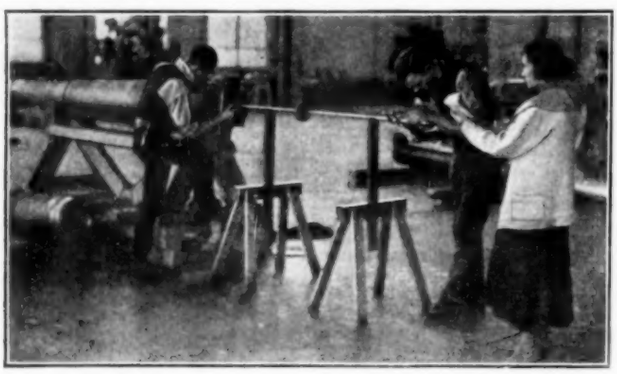


FIG. 51. FINAL STAR-GAGING OF THE GUN BORE

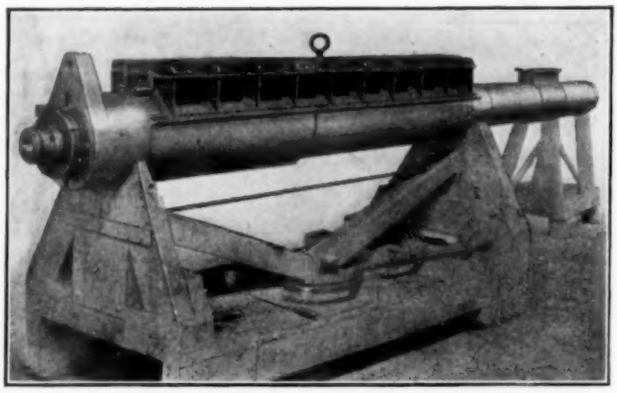


FIG. 52. SLEIGH GAGE FOR CHECKING SURFACES OF THE SLIDE GUIDES

Throughout all boring and rifling operations the bore of the gun must be carefully inspected and star-gaged. Inspectors handling a star gage in the bore of the gun after one of the operations are shown, Fig. 51, together with the woman clerk, who is recording their observations and thus saving the services of one man. A sleigh gage, Fig. 52, is used for the inspection and check on the scraping of the finished bearing surfaces of the slide guides.

Efficient Pattern Storage

By E. A. Dixie

In many shops little attention is given to pattern storage. It does not require much argument or intelligence to see that this is poor policy. Today, with the high cost of labor and materials, pattern costs are several hundred per cent. higher than they were ten years ago. Wooden patterns are fragile affairs at best, and the longer they are dried out in storage the more fragile they become. Each time a pattern goes to the foundry it acquires a new coating of foundry sand which is carried back on it to the storage room, and

FIG. 1. VIEW OF PATTERN STORAGE RACKS

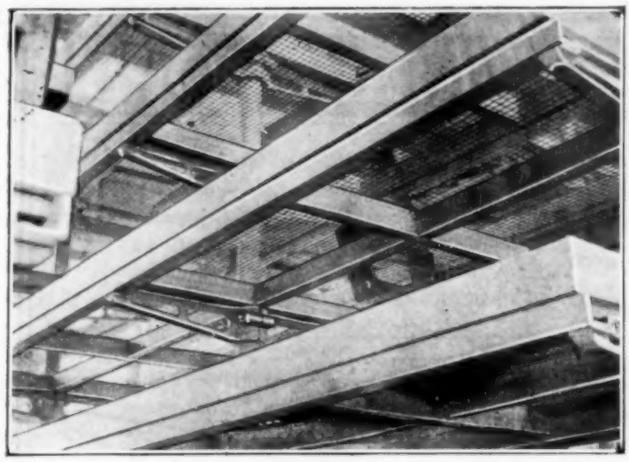


FIG. 2. LOOKING UP FROM BELOW THE RACKS

tends to make this place one of dust and discomfort for those who have to take care of the patterns.

In Fig. 1 is shown a part of the pattern storage room of the Taylor & Fenn Co., Hartford, Conn. The castings used for supporting the shelves are from the well-known patterns of the Brown & Sharpe Co., Providence, R. I., but the construction of the shelves differs materially from the B. & S. practice.

The room in which the patterns are stored is lighted from both sides by windows which reach from the ceiling to about 3 ft. from the floor, so that there is plenty of light.

The pattern racks run down one side of the room and are disposed at right angles to the center line of the room. The racks are 39 in. wide and 16 ft. long with a 30-in. alleyway in between them. At the right-hand end, considering Fig. 1, there is a 4-ft. passage between the ends of the racks and the windows.

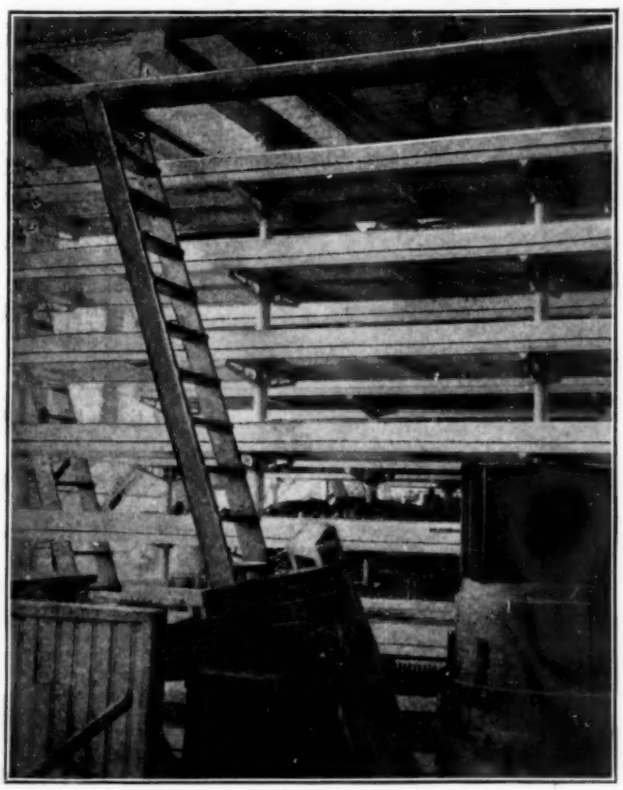


FIG. 3. THE LADDERS

The posts for the racks are made of 3-in. wrought-iron pipe, and four of them are equidistantly disposed throughout the 16-ft. length of each of the shelves. The length of the posts is about 11 ft. 6 in. and they extend from the floor to the beam overhead, to which they are connected. The distance between the bottom shelf and the one immediately over it is 23 in.; the rest of the shelves are spaced vertically about 19 in. apart.

As in the B. & S. construction, a 1½-in. angle iron (shown in Fig. 2) runs along the edge of the shelves and is secured to the cast-iron brackets. In the B. & S. construction this angle iron supports the boards which form the bottoms of the shelves. Board bottoms for pattern-storage shelves are not good as the molding sand and dust accumulate on them and they are difficult to clean. In these shelves the board bottoms are eliminated and rectangular frames of 2 x 3-in. spruce are fitted to the angle irons, and 2 x 3-in. spruce is also fitted between the posts lengthwise of the shelves. Over this framework, galvanized-iron-wire netting, ¾-in. mesh, is stretched. At the outside it is cut to overlap the 2 x 3's about 1 in. and the edge is hammered over so that there are no sharp wires to scratch the patterns. The netting is fastened to the 2 x 3's with ¾-in. staples. To cover the edges and to make a margin for the shelves, ¾ x 4-in. boards are nailed to the 2 x 3's. The disposition of the angle irons, the cross and lengthwise 2 x 3's and the wire netting are clearly shown in Fig. 2, which is a view taken at an angle looking upward under the racks. The ¾ x 4-in. boards provide a margin or edge, 2 in. high above the netting, which is quite high enough to prevent patterns from falling off the shelves.

For fire protection, sprinkler heads are disposed at intervals over the racks. In the alleyways between the racks are ladders which are hung on overhead tracks. These can be seen in all the illustrations, but the method of hanging them is shown in Fig. 3.

Every other rack is wired and a socket is provided for an electric-lamp extension which is long enough to cover that entire zone.

The other side of this pattern storage room is used for the patterns which are too large for storage on the shelves.

With this system of racks and the method of tabulating the stock of patterns, the pattern-storage man can locate any pattern almost instantly. The patterns are comparatively clean, as practically all the sand that sticks to the patterns as they come from the foundry becomes dislodged and falls through the wire netting to the floor, whence it is easily brushed away.

It is worthy of mention that the racks and walls of the room are painted with glossy white paint which does not absorb the light transmitted through the windows as dark paint is so prone to do.

Which Side Do You Stand On?

BY J. A. RAUGHT

On page 1064, Vol. 51, Sandy Copeland asks the above question.

Speaking of a planing machine, I will say most emphatically that the operator stands on the left side. Speaking of a crank shaping machine (I assume he means a shaper), the cone and feed works on most such machines are on the left side, though on some of the older types the cone is on the right side and the feed works on the left or operating side.

FOR SMALL SHOPS *and* ALL SHOPS

By J. A. Lucas

DRAFTING-ROOM KINKS

Testing Abrasive Wheels for Efficiency

By RAYMOND FRANCIS YATES

Little has been done in the way of testing the efficiency of abrasive wheels, most users being willing to accept without question the one which turned out the most work. A device for testing the relative merits of different wheels should open a field of research with great possibilities.

THE modern artificial abrasive wheel has become an indispensable article in the industrial world, and many mechanical operations are being performed today by its use that could not be done by other methods. A quarter of a century ago the emery wheel reigned supreme, but with the advent of artificial abrasive substances such as carborundum, aloxite, crystalon and alundum the use of the emery wheel has become very limited.

The finding of the true cutting efficiency of abrasive wheels for different substances constituted a problem

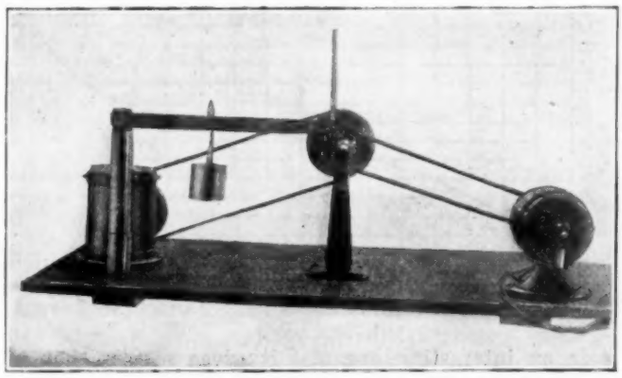


FIG. 1. ABRASIVE-WHEEL TESTING APPARATUS

that has been somewhat difficult to solve. The testing of abrasive wheels in the past has been carried out by rule-of-thumb methods and no actual formula has been devised that would express the efficiency of a wheel on a given substance in cold figures. A manufacturer may find that a workman can grind 400 small castings per day with one wheel of a certain grade and grit, while 350 can be ground in a day with another wheel. As far as practice is concerned, the manufacturer is satisfied to use the wheel that produces the most work. While such testing methods may suffice for the consumer of abrasive wheels it must be confessed that it is not a scientific method and that the manufacturer of abrasive wheels should rely upon a more carefully conducted test which will show in accurate figures the efficiency of one wheel over another.

Having in mind the importance of a machine which would give the various factors entering into a formula for the calculation of abrasive efficiency, the author designed and constructed the simple machine herein described. The tests with the machine were conducted in the laboratories of the American Society of Experimental Engineers and the data set forth in this article is taken from the author's laboratory notebook. The tests which were conducted were by no means exhaustive but it is hoped that they will introduce the subject to the reader and carry some hint of their importance to those who are concerned with the work.

Before entering into the subject of the abrasive testing machine and its operation, a few general facts concerning the manufacture and nature of abrasive wheels will be given to afford the uninformed reader a better understanding of the machine than he would gather otherwise.

Wheels are made in various grits, grades and bonds. By grit is meant the size of the abrasive particles that constitute the wheel. For instance, if a wheel is 30

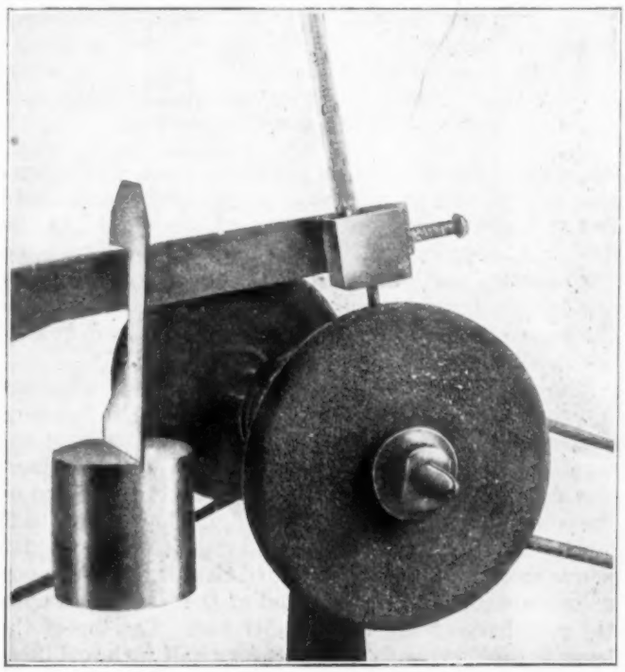


FIG. 2. THERMOMETER AND TEST PIECE IN BLOCK

grit it is known that the particles composing the wheel are able to pass through a screen having 30 meshes to the square inch. Thus 10 would represent a very coarse wheel, while 200 would indicate a wheel composed of very fine particles. Grade refers more or less to the nature of the abrasive substance, that is as regards its temper or hardness. The electrothermic production of the artificial abrasives of today is under such perfect control that it is possible to produce abrasive substances of varying hardness. The bond of a wheel is the substance that holds the abrasive particles together in a solid form. Different bonds are recognized as vitrified, silicate, shellac and rubber. The particles in a vitrified wheel are held together by a clay that has undergone vitrification in a vitrifying kiln. The silicate wheel is held together by silicate of soda which is merely baked to a solid form. Shellac wheels are bonded by ordinary shellac and they are, of course, used for special purposes. Like rubber wheels, their use is so limited that nothing more will be said of them in this treatment. The bonding process in the manufacture of an abrasive wheel is very carefully regulated, and a wheel can be made of practically any degree of hardness. The bond of a wheel is extremely important and is a large factor in the de-

termination of its efficiency when cutting certain substances. If a wheel is cutting cast iron, for instance, and its bond is not of the proper nature, the particles may

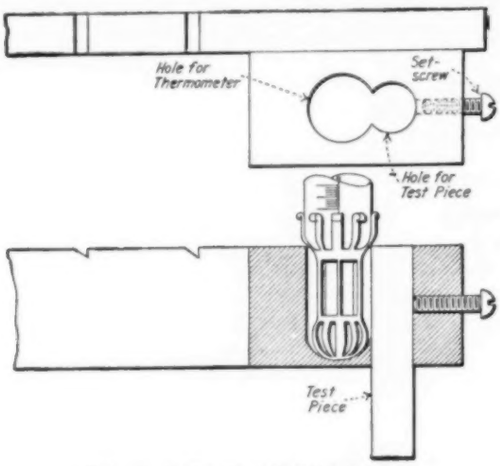


FIG. 3. DETAIL OF END BLOCK

lose their sharpness and yet remain in place, or the bond may not be able to hold until they become sufficiently dull to break away from the rest of the wheel. In the first case, very low cutting efficiency will result as the dull abrasive particles hang to the wheel and cause undue friction in rubbing over the surface of the iron. In the second case, the wheel may cut freely and quickly but it will wear down very rapidly.

The machine used by the author to conduct efficiency tests on abrasive wheels is shown in Fig. 1. It is a very simple device and it must be confessed that it was put together somewhat hurriedly. A small grinding head was used and a pulley was placed upon the free end of the spindle. This pulley was belted to a tachometer with a ratio of 1:1. The grinding head was driven by a small power motor. A lever of the third class is mounted upon a standard and the opposite end of the lever rests upon the periphery of the wheel under test. The top of the lever is provided with notches every half inch and these notches are cut to accommodate a weight so that the

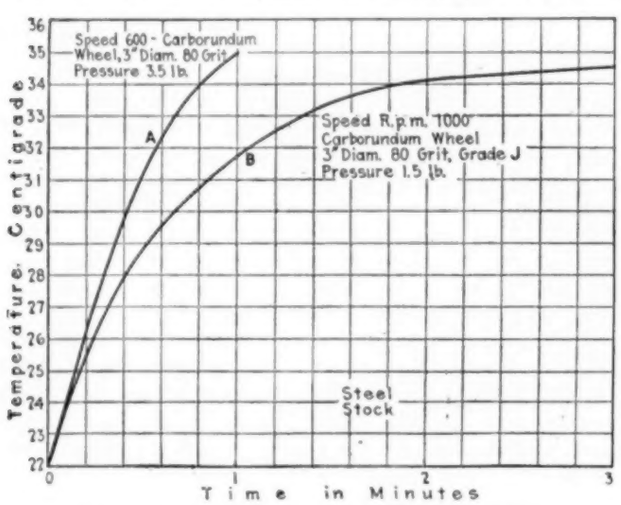

Speed 600 - Carborundum Wheel, 3" Diam. 80 Grit Pressure 3.5 lb.
Speed R.p.m. 1000 Carborundum Wheel 3" Diam. 80 Grit, Grade J Pressure 1.5 lb.
A
B
Steel Stock
Temperature Centigrade
Time in Minutes

FIG. 4. GRAPH SHOWING EFFECT OF SPEED

pressure upon the surface of the wheel can be accurately adjusted by moving the weight either closer or farther away from the wheel. Attached to the end of the lever is a small copper block which is drilled out as shown in Fig. 2. First a hole $\frac{1}{2}$ in. in diameter is drilled through the piece. Another hole is drilled into this at right angles and tapped for an 8/32 setscrew. A third hole is drilled with a No. 14 drill so that it will just break into the first hole drilled through the piece. This hole, however, does not extend through the piece, as will be noticed. The first hole accommodates the test piece of material which is $\frac{1}{2}$ in. in diameter and 1 in. long. It should be a very close fit in the hole, and it is held in place by the setscrew. The other hole is used to accommodate the tip of the thermometer so that any heat developed in the test piece will be conducted to the thermometer. To obviate any possible loss in thermal conduction, the tip of the thermometer rests in a bath of mercury thereby connecting the test piece with the thermometer by a metallic path. In order to prevent the mercury from finding its way out the test piece must fit very closely into its hole as stated before. Fig. 3 gives an enlarged view of the block.

Some very interesting curves were plotted by the use of this machine, showing the relation between temperature and time with steel stock at given pressures on different grades of wheels. The curve *A* shown in Fig.

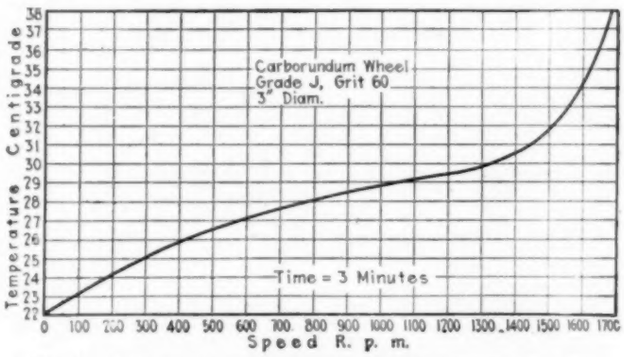


FIG. 5. GRAPH ILLUSTRATING BEST CUTTING SPEED

4 is an interesting one and it gives results that tell just how the wheel is performing. The speed was 600 r.p.m. (surface velocity 471 ft. per min.) with a carborundum wheel 3 in. in diameter, 80 grit. The test piece rested upon the wheel under a pressure of 3.5 lb. It will be seen that the temperature rise was fairly rapid until 31 deg. was reached and at that point the curve rounded out. The time element was 1 min. A surprising result was obtained with the same wheel by increasing the speed to 1000 r.p.m. and running the test for 3 min., curve *B*. The temperature rose rather abruptly until it reached 34 deg. at which point the curve flattened out. Although the temperature rose more quickly in this test than it did in the previous one, over four times as much stock was removed from the test piece of steel in 3 min. than was removed in the previous test in 1 min. The result of these two tests shows that although the temperature mounted more rapidly in the second case the cutting efficiency was also made greater by the increase in speed. It is well to mention here that the temperature is a factor that is generally controlled by the friction. If a wheel is too hard for a certain metal and the abrasive particles do not break away from their setting after becoming dull, considerable friction will be produced and the temperature will rise correspondingly. The abrasive particles will rub over the surface of the metal without cutting and of course this friction will give rise to heat and this heat can be taken as an indication of the fric-

tion produced. In the average case the temperature rise in a given time can be taken as some indication of the cutting efficiency of a wheel. The two tests previously cited are interesting to note in this respect. Although the temperature rose more abruptly when the wheel was travelling at a speed of 1000 r.p.m. it was found that the abrasive efficiency was greater than when the wheel was travelling at 600 r.p.m.

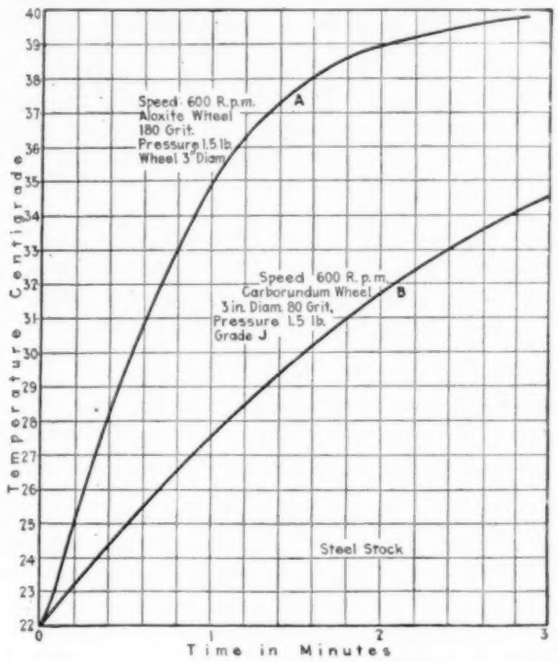


FIG. 6. GRAPH SHOWING EFFECTS OF DIFFERENT ABRASIVES

The curve shown in Fig. 5 is a notable one and it shows how excessive speed on a wheel will reduce its cutting power. The wheel used was carborundum, grade J, grit 60, 3 in. in diameter. Starting at 100 r.p.m. the speed was gradually increased to 1700. Up to 1300 r.p.m., the rise in temperature was very gradual, but beyond this speed the temperature suddenly mounted to 38 deg., showing that the most efficient cutting speed for this wheel was in the neighborhood of 1300 r.p.m. A test conducted afterward showed that this was true. During a 3-min. run more metal was removed from the test piece at 1300 r.p.m. than at 700 r.p.m. and the temperature in the first case was lower.

Curve *A*, Fig. 6, gives the results obtained by an aloxite wheel of 180 grit with a pressure of 1.5 lb. at 600 r.p.m. The temperature in this case mounted rapidly to 40 deg. and the time was 3 min. The high temperature developed in this wheel was attributed to its very fine grit.

A test with a 3-in. carborundum wheel, 80 grit, grade J, with a pressure of 1.5 lb. at 600 r.p.m. is shown in Fig. 6, curve *B*. Steel stock was used for the test piece and the temperature took a very normal rise to 35 deg. in the 3 operating minutes.

The tests conducted by the author were by no means exhaustive but with the data set forth in this article those who are interested will be able to construct a machine and conduct experiments with it. The author hopes that he has at least made clear the importance of the device and the possibility of developing it into a reliable testing machine to determine the abrasive efficiency of various wheels of various substances. One large manufacturer of abrasive wheels emphasizes the fact that the "right wheel should be used in the right place" and this little machine, if properly developed, will certainly aid in bringing this about.

Other interesting charts could be plotted showing the relationship of temperature and pressure as well as speed and temperature at given pressures, and also between the amount of metal removed and the rise in temperature.

Inventors' Troubles and How to Prevent Them

BY E. H. MICHAELIS
Consulting Mechanical Engineer

MY BUSINESS brings me in contact with quite a number of inventors and I have occasion to hear their tales of woe and their troubles. I will let one of my clients tell you his experiences and then I will try to show how most of these troubles can be avoided. It is impossible to do away with all of them, for such troubles as interference proceedings and infringement cases cannot be entirely eliminated.

"I am a machinist," said my client, "and had been working on my invention for more than 18 months before I was satisfied that it was worth while to spend money on having it protected by patents. I had seen lots of advertisements of different patent attorneys in magazines and Sunday papers and so I wrote to some of them to give me information as to how to apply for a patent, the cost of it, etc. In due time I received my answers. There were all kinds of booklets and leaflets stating the terms and prices of the sender. Nearly all of them were alike in stating that the patent attorney sending them had had years and years of experience in his work and could refer to thousands of satisfied clients. They all said they would examine my invention if I would send them sketches and a description or model and that they would pass on the patentability of it and send me a report for the price of five dollars. In some cases this amount was to be deducted from the fees, provided I would let them apply for my patent; in others, it was in addition to the patent fees. One of them offered to file my case if I would pay the first Government fee, the attorney's fee and price of drawings not to be paid until my patent was allowed. In case the application was rejected, I would not have to pay anything. This last offer looked too good to me, because I could not understand how anybody, even a patent attorney, could work for nothing or guarantee me a patent.

"I decided to send my model and five dollars to one of the others and in about two weeks I received a letter containing the report on the search, stating that there was nothing in the way, that they would advise me to go ahead with my application and that their fee would be 75 dollars distributed as follows: attorney, 35 dollars; one sheet of drawings, five dollars; first Government fee, 15 dollars; final Government fee, 20 dollars.

This last amount was to be payable only after my patent had been granted. If I intended to authorize them to prepare my case I should send them 25 dollars cash. This I did and by return mail I received the blank form for a patent application. On this form was printed the petition, power of attorney made out to the patent attorney, the preamble for the specification and the oath. Three spaces were marked where I was to sign the papers. Together with these papers I was to send the balance of the fee amounting to 35 dollars. I followed their instructions promptly and in a short time the acknowledgment that they had received my remittance came to hand. Then I did not hear from them for quite a while and finally I wrote, inquiring what they were doing in my case. After about a week I got a letter inclosing the filing notice of my application and a letter stating that they would keep me informed as the case progressed.

"I have not heard from them for about three months now and cannot get any satisfaction. In the meantime I have talked to a few friends about my patent and they tell me that I am protected and can sell my patent right or put my invention on the market. To do that I need a set of drawings and I am here to have you make them for me."

Invention Is Not Protected Until Patent Is Issued

The first thing I did was to call the attention of the inventor to the fact that his invention was not protected; at least not legally, because his monopoly on the right of manufacture and sale of his invention would not begin until his patent had been issued to him. He could, however, mark his article "Patent applied for" or "Patent pending" and add the serial number of his filing notice. That would scare off other manufacturers; but if one should start to make and sell the same article, he, the inventor, would not have any legal remedy. I asked him if he had a copy of the patent drawing and his application. He said that he had not seen anything beside the papers he signed. He had not seen, let alone read, the specification and claims as set forth by his attorney.

Now Rule 31 of the "Rules of Practice in the U. S. Patent Office" reads as follows: "Every application signed or sworn to in blank, or without actual inspection by the applicant of the petition and specification, and every application altered or partly filled up after being signed or sworn to, will be stricken from the files." This means that the application of my client was void at the time it was being filed.

I told him to ask his attorney to furnish him with a copy of the drawings, specification and claims. He followed my advice and after corresponding back and forth, received copies and brought them to me. Together we started to examine the application. Everything was all right until we came to the claims. There we found that the attorney had not grasped the idea or the spirit of the invention at all. The claims set forth everything but the essential part of the invention; they covered nothing but incidental parts and if the patent had been granted as applied for, it would have been absolutely worthless, because anybody could evade what was covered by those claims.

The inventor grew angry and was for taking the case out of the hands of this attorney, if it could be done. "This can be done," I told him, "by the simple act of revoking the power of attorney filed in the Patent Office. However, it is better to try another way first. Let us write to your attorney, call his attention to the things he overlooked and suggest some claims which will cover the invention thoroughly." This we did and as answer received a letter from the attorney saying that he was taking care of the case as well as anybody could do it, that there was one claim allowed and that he was ready to accept this and have the patent issued. If we had let him do this, the resulting patent would have been simply a scrap of paper limited to one narrow claim. Therefore, the inventor revoked the power of attorney given the patent attorney and turned the case over to our local patent attorney. After going over all the papers, the local attorney started the case all over again. He told the inventor that the search he would make would be an exhaustive one, that it would include all patents issued in the United States along the lines of his invention, but would not include foreign patents and patents pending in the U. S. Patent Office.

After the search was made the local attorney worked out a new application, gave the inventor a chance to examine and approve the specification and claims, and then asked him to sign the papers.

This case shows, exactly, what the source of most of the troubles is and why there are so many worthless patents which cost the patentee a lot of money and do not bring any returns.

It is a very hard proposition for most people to describe in a letter any object, especially a mechanical invention, so that somebody else will understand it thoroughly; therefore, it is to the advantage of an inventor to go to the nearest patent attorney in person. He can then talk to him face to face and the attorney can ask questions until he really understands the invention. The applicant has a chance to inspect the drawings, specification and claims of the original application and later on the amendments and arguments put in by his attorney after the Patent Office has taken action. A patent attorney who will accept the first decision of the Patent Office without trying to get all he can for his client, does not give the right service and does not do his duty.

If you are living in Iowa and your attorney is located in New York or Washington, you do not know what he is doing. His practice comes to him mostly through advertising in magazines and Sunday papers and if you are not satisfied with his services you cannot hurt him. But if you employ your local patent attorney, or one that you can reach by making short trips, you have the opportunity to talk to him personally and he has to satisfy you, because you can either help him or hurt him very much; and you can depend on it, there is no business man, be he patent attorney or shoemaker, who does not want to be helped along.

My advice to inventors, therefore, is:

1. Employ wherever possible a patent attorney who does local business only and whom you can see personally as often as necessary.

2. Where it is not possible to do this, insist on seeing and inspecting all the papers and drawings before signing your application.

3. Have your attorney forward to you all communications from the Patent Office and the answers he intends to send in before he does so.

Large Work at the Poole Engineering and Machine Co.'s Shop

By E. A. SUVERKROP

A few heavy machine tools built by some of the older engineers, while perhaps not of such pleasing design as those built in later years, have done and are continuing to do work that cannot be excelled by more modern tools. The shop in which the tools described in this article are to be found has been noted both in this country and abroad for its good work for several generations. Many years ago, before the advent of the cylindrical grinding machine, the late J. Morton Poole built such a machine for grinding calender rolls, the accuracy and finish of which were wonders of the mechanical world.

THE Poole Engineering and Machine Co., Baltimore, Md., which is one of the oldest of the American machine shops turning out really large work, was established about 60 years ago. The writer has never met Mr. Poole but has talked with a number of men who worked with him, and the general impression gathered is that he was an exceptional engineer with remarkable insight into the future and anticipation of the big things in engineering. Large work and accurate work seem to have been his hobbies. Many of the large tools used in the shops were built there, and although many of them have been superceded by more modern and efficient tools built by specialists, two notable ones still remain and are likely to remain for years to come; that is, the big measuring machine and the big pit lathe. While considering these two tools the reader must remember that they both date back nearly half a century.

The bed of the measuring machine, Fig. 1, is 22 ft. long and is a single piece. At the front a T-slot is planed in the top for the reception of the measuring heads. When preparing to measure, the head *A* is first set to approximate position and clamped by the knurled nut. The head *BC* is similar to the sliding head of a vernier caliper. The adjusting screw *D* is fixed in the head *B* and projects through the member *C*. Between *B* and *C* is a helical spring which forces *B* away from *C* to the limit permitted by the adjusting nut *E*.

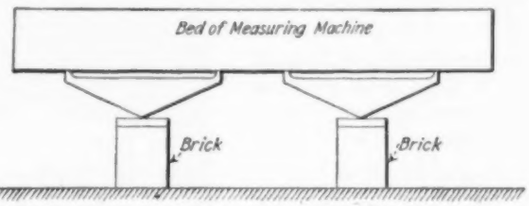


FIG. 2. METHOD OF SUPPORTING THE BED

When making long pin or bar gages they are supported on V-blocks *F*, of which there are a number. A set of jaws is provided for measuring snap gages for external measuring. These clamp direct to the measuring members of the heads *A* and *B*, and by their use snap gages up to nearly 22 ft. can be checked.

A 12-ft. Brown & Sharpe vernier is used for setting all sizes within its capacity. For greater lengths, two bars of known length are made up and laid end to end in the V-blocks.

The method of supporting the bed is about as near correct as it can be. There are two brick columns with metal caps. These support the two rockers which in turn support the bed at two points each. This is shown diagrammatically in Fig. 2.

The pit lathe shown in Fig. 3 was built about 40 years ago by Mr. Poole. The pit was designed to accommodate work up to 100 ft. in diameter. However, the largest job so far, was a sand wheel for the Calumet and Hecla mine which was turned out about 25 years ago. It is still in use at the mine disposing of the "tailings." The wheel is 65 ft. in diameter, provided with buckets at the rim. It is driven by a ring of spur teeth near its perimeter. The teeth were cut while the job was in the lathe, using a gear-cutting attachment and an end mill. The pitch of the teeth is approximately 5 in. One of the men who worked on the sand wheel told me that when it was tested up after completion: "The rim ran true within 0.002 inch."

Normally the pit lathe will swing 66 ft., but the head can be blocked up if necessary to swing 100 ft.

The spindle *A*, Fig. 3, is cast iron about 24 in. in diameter at the rear bearing and about 30 in. in diameter at the front. A belt from the countershaft drives a large seven-step cone, between which and the faceplate drive there are several reductions. There is provision for driving either through

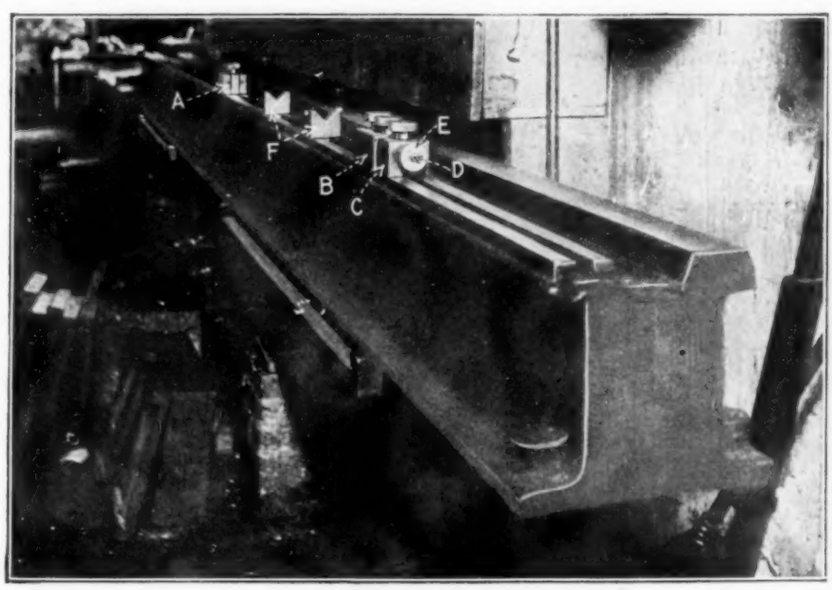


FIG. 1. 22-FT. MEASURING MACHINE

the faceplate gear or through the gear mounted direct on the spindle. In this way a wide range of speeds is obtainable, suitable for a variety of sizes and materials. In this connection it may be mentioned that at the time this lathe was designed many mortise gears were used in mill drives. The cogs of these gears were usually made of hard maple or other wood, the turning speed for which is much greater than that of metal.

The ring *A*, Fig. 4, is built up from a number of steel castings and is about 28 ft. in diameter. The large faceplate *B* is built up in sections, and at the edge has a turned flange *C* about 2 in. thick by about 3 in. wide. This flange takes a bearing between the two large angle plates *D*, at an elevation almost in line with the tool pressure on the work. Anyone who has run an old-fashioned pit lathe on work such as segments of circles will at once appreciate that this double support of the rim of the faceplate will almost entirely eliminate end movement of the spindle, faceplate and work.

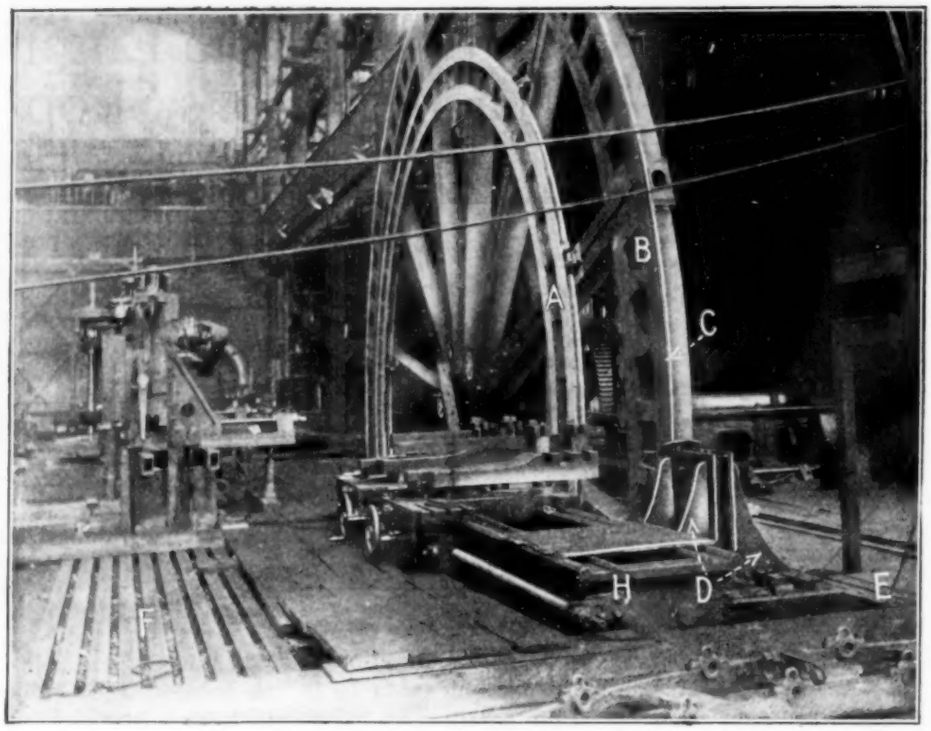


FIG. 4. THE BIG PIT LATHE

There are a number of attachments for this machine. These have accumulated in the years since it was built. One is a large Gleason gear cutter used principally for mortise gears. The dividing head of the machine is stored in the pit where it could not be photographed but the ways for the shaping slide and its drive are shown in Fig. 5.

This is the same outfit that was used for milling the teeth in the big sand wheel previously referred to. In order that those who are not familiar with this work may know how it is done I refer them to Fig. 6. Here is a much smaller machine built by Gleason of Rochester, N. Y. and capable of shaping the teeth of gears up to only 10 ft. in diameter. Similiar reference letters will wherever possible be used in Figs. 5 and 6, so that there will be no chance of confusion. The slide *A* has a carriage *B* which is reciprocated by a crank *C* and connecting-rod *D*. The length of stroke can be readily adjusted. Mounted on top of the carriage *B* is a cutter head *E* which carries a rotary cutter *F* driven from the overhead drum by the belt *GG*. The reciprocating mechanism *C* is driven by the belt *HH*.

Both spur and bevel gears can be cut in this. In order to cut bevel gears the slide *A* must be capable of being adjusted to the angle of the tooth flank. As there seems to be no such provision in the old Poole attachment shown in Fig. 5 I assume that it was for spur gears only. There is also apparently no place to which the former *I*, Fig. 6, can be attached. A further reason might also be found in the fact that the teeth of the big sand wheel were cut with an end mill.

Another one of these big lathe accessories, perhaps

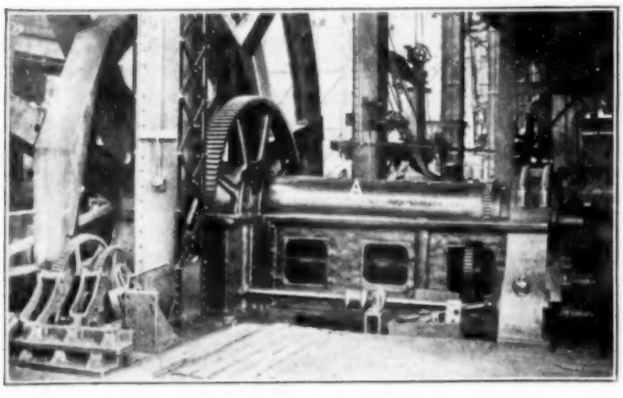


FIG. 3. THE BIG PIT LATHE HEAD

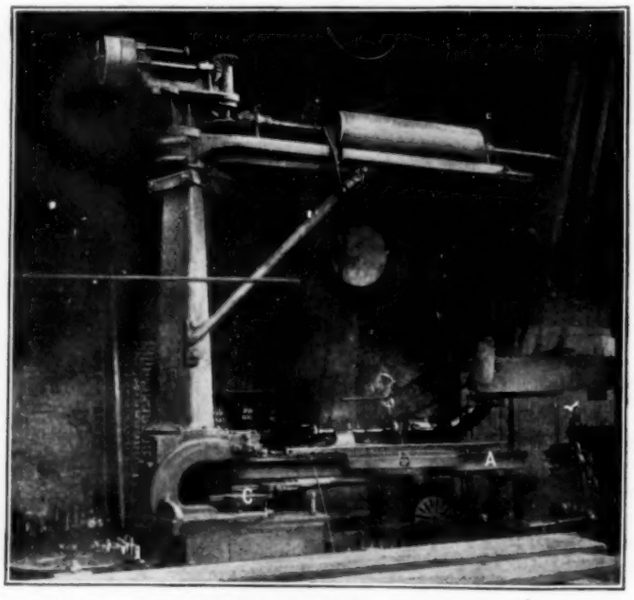


FIG. 5. POOLE MORTISE GEAR-CUTTING MACHINE

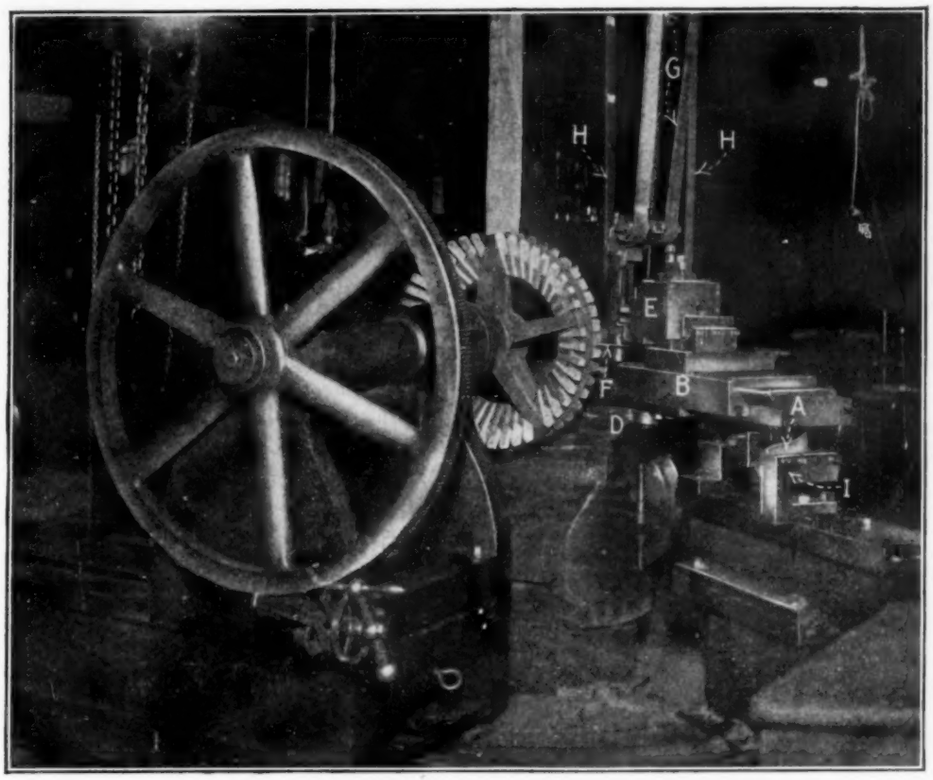


FIG. 6. CUTTING BEVEL MORTISE GEAR

it had better be called a *shop* accessory, is the portable milling machine shown in Fig. 7 where it has been used for milling the locking keyseats on the tracks for the 16-in. gun turrets for the battleship "Maryland." These tracks are 28 ft. outside diameter and each of them weighs 38 tons. They are built up from four castings which are bolted together with fitted bolts.

The first operation is to plane the bottom after which the joints are planed on a big Detrick & Harvey open-side planing machine. When finished and bolted together the planed joint must not admit a 0.002-in. feeler; the planing job therefore calls for exceptionally close work. The method of obtaining such close joints is shown in Fig. 8.

The individual castings are chalked and roughly laid off. The length of the chord *C* is either taken from the blueprint or calculated and laid out roughly on the job. The faces *AA* and *BB* are also approximately laid out so that the excess metal for finishing is equal at both ends. The work is now placed in approximate position on the planing machine, with the point *F* in *AA* a certain distance from the edge of the planing-machine table. The point *D* is now located the same distance from the edge of the planing-machine table as *F*, the line *DF* being the radius of the circle of which *FF'* is a part. With the trammel set to this radius the casting is swung (about *F* as a center) till the trammel (with one point at *D*) touched both *F* and *F'*. The work is now bolted down and the joint *AA* planed, and after it is finished the work is turned around as shown at the right. The joint *BB* is set the same distance from the edge of the planing-machine table as the center punch mark *D*. The trammels are now used to test the location of the arc *F'F*, relative to the center punch mark *D*. If care be used the point *F* in *AA* can be easily brought to within say 0.005 in.

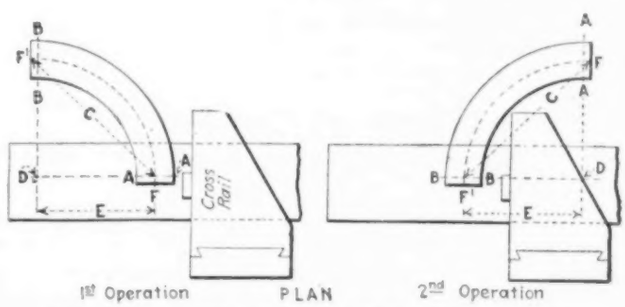


FIG. 8. HOW THE CLOSE JOINTS WERE PLANED

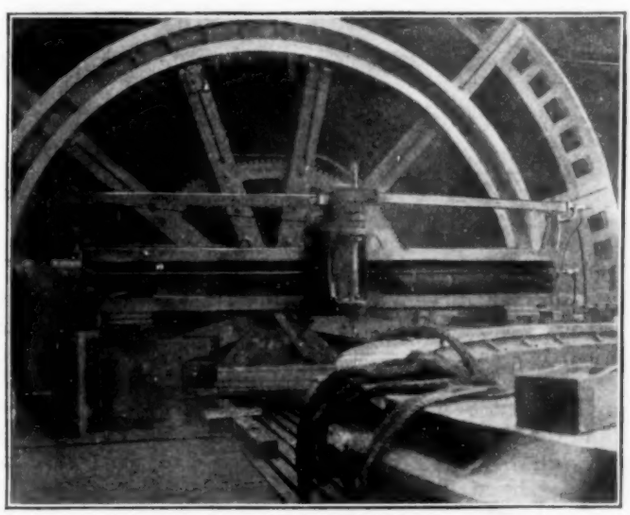


FIG. 7. LARGE PORTABLE MILLING MACHINE

of its proper position which would bring the face *BB* well within the prescribed limit of 0.002 in.

Design of Steam-Hammer Swagers

BY A. S. HESSE

Swages are commonly made in two types—the open, shown at *A*, and the closed, shown at *B*, Fig. 1. I consider the latter to be superior for a great deal of work. This type incloses the entire circumference of the forging and insures an accuracy of size which is not so certainly obtained with the open swage that incloses only the upper and lower thirds of the circumference.

Closed swages should have a full bearing on each side of the pass, to aid them to hold their shape when they come together. They must also be provided with relief on each side to accommodate the metal that does not draw or exude through the pass when the hammer blow is struck. Unless this relief is provided a certain

amount will spread outward at each blow of the hammer, causing the swage to pinch the forging. This effect is more pronounced on pieces that are too large for properly starting the swaging operation.

The relief generally considered good practice is one-twelfth of the circumference relieved on each half of the swage on each side of the parting line, as indicated in Fig. 2. This relief tapers away at a tangent from the circumference of the pass. At the parting the corners are rounded off in proportion to the size of the pass to prevent the corners from digging in.

Allowance should be made for the shrinkage of the forging when it cools, as shown in Fig. 3, which shows some of the essential details for a 6-in. swage.

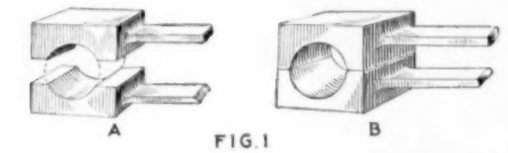


FIG. 1

FIG. 2

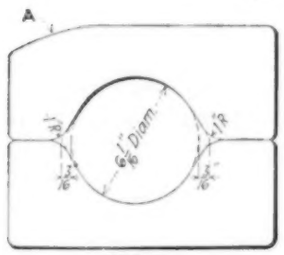


FIG 3

FIGS. 1 TO 3. EXAMPLES OF SWAGES

Fig. 1—Swages for round stock, open and closed. Fig. 2—Showing relief at corners of swage. Fig. 3—Correct design for a 6-in. swage.

The pass must not be less than $6\frac{1}{16}$-in. diameter for the upper and lower thirds of the two swage halves. Forged swages are made complete in the smith shop. The smith should fit this swage hot on a $6\frac{1}{4}$-in. mandrel, or one slightly larger to allow for the double shrinkage from the making of the swage to the completion of the work in the swage.

When swages are fitted hot around a mandrel there is little need to pay much attention to the side relief, as the spreading action during fitting will afford relief. The corners must be rounded off to not less than the 1-in. radius for this size, and most of this rounding should be done before fitting to the mandrel.

It is not practical to swage stock of more than $\frac{1}{4}$ in. to $\frac{3}{8}$ in. over the size of the pass of this 6-in. swage. When forging stock that is only roughly rounded up from the square before putting it into the swage, more side clearance must be allowed to provide for the corners.

When swaging tubing, very little side clearance need be allowed, as this work must be handled differently, for the reason that part of the pass must be tapered from the largest diameter of the tubing at the start of the swaging operation to the diameter to which it is to be reduced at the finish. Into this tapered portion of the swage the tubing must be fed gradually, as the blows of the hammer reduce its size; otherwise it would be crushed and distorted. The outside-face edges on swages (see *B*, Fig. 2) must be rounded off with a medium degree of radius to prevent nicking and marking the bars.

An experienced smith when swaging will not take too big a bite and will use judgment as to the amount of stock to be left for rounding up. The more stock that has been left the shorter should be the bite which he takes as the work advances into the swage.

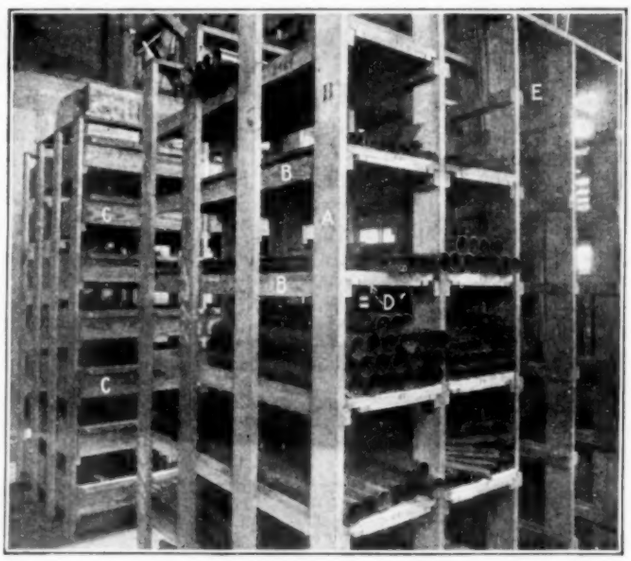
The upper half of the swage should be rounded on its front end *A*, so that the force of the blow will come nearer to the center of the pass. Leaving this corner straight in line with the top surface is the most common cause of swage handles breaking when too much stock is allowed for rounding up in the pass.

Another prolific cause for breakage of swages is hollow or uneven dies on the hammer.

A Triple-Purpose Rack

BY I. B. RICH

The illustration shows a convenient and yet inexpensive form of storage rack, designed by J. P. Rombach, factory manager of the Glen L. Martin Co., Cleveland, Ohio. The racks themselves consist simply of the uprights *A* and the horizontal cleats *B*. Tote boxes of suitable size are held by the cleats as shown at *C*.



THREE WAYS OF USING A SIMPLE RACK

By substituting boards or platforms as at *D*, horizontal storage for short tubes or other material is easily secured. These boards are easily removable, so that boxes can be used at any time when it is found more convenient to do so.

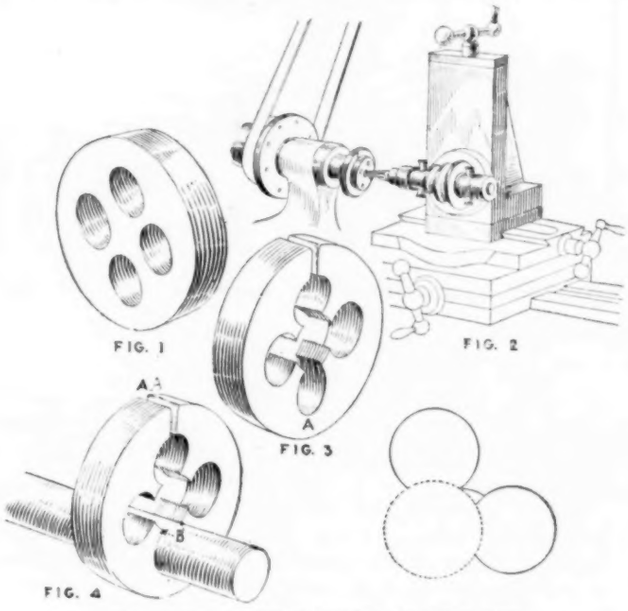
By removing the boards and leaving only the uprights and cleats, long tubing and other material can be easily stored as shown at *E*. There are doubtless many places where racks of this kind will be found extremely useful on account of the elasticity of the whole arrangement and the ease with which the storage space can be varied. It will be noted that the boards and platforms are braced by strips along the underside and also that the cross-strip in front provides a convenient handle for removing or otherwise handling them.

Small Round Threading Dies

By Atol Maker

On page 385, Vol. 51, *American Machinist*, M. H. Potter has written a short article partly describing the making of small round threading dies. A few additional comments on such dies should be of interest.

When the dies are to be made in small quantities, the following process may be followed if excellent dies are desirable: The four holes shown in Fig. 1 may be drilled and reamed in a simple jig and then plugged up with a steel similar to the steel in the die blank. The die should then be set up in a bench lathe, preferably



FIGS. 1 TO 4. EVOLUTION OF THE DIE

one equipped with a push spindle tailstock, and drilled and tapped to size. A set of four or five taps should be used, each tap removing its share of stock from the blank. The final tap should be to size, sharp, and should only remove a few thousandths of stock from the blank. After this operation, the plugs should be removed.

This method of plugging the holes to permit tapping is superior to another method often employed (tapping first, then counterboring the four holes), because in the former operation the edges are sharp and clean cut, while in the latter they are blunt and burred.

The die can be backed off while set up in the spring collet of the bench lathe, a milling attachment equipped with a tapered mill being used as shown at Fig. 2.

After being hardened and drawn in any convenient manner, the die should be dipped in a lead bath so as to draw it to a blue at point *A*, Fig. 3, which will minimize the danger of breaking at this, the weakest point.

The die may be given a fine cutting edge by grinding. This may be accomplished with the same set-up used for backing off the die. An oil stone tapered to correspond to the mill used in backing off is used for the grinding.

When the dies become dull they may be reclaimed by grinding before they are too far gone. Of course they are reground in the same manner as the first grinding, also they should be lapped as shown at Fig. 4, pressure being applied at *A*. The lap will remove metal at points *B*, thus giving a clean cutting edge to the die.

Hobbing Wormwheels on a Hand Milling Machine

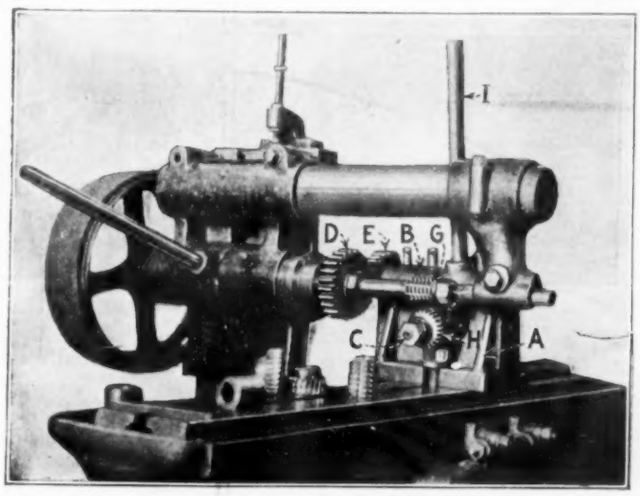
By J. B. Dunton

Where wormwheels of one kind are to be made in limited quantities, an attachment to a milling machine such as is shown in the illustration will be found very efficient.

The attachment consists of the base *A*, the swinging wormwheel housing *B*, work spindle *C*, and the gears *D* and *E*. The hob is shown at *G* and the wormwheel to be cut at *H*.

The work arbor is rotated by a worm and wormwheel, contained in the swinging housing *B*, through the gears *D* and *E*, all of which must be so proportioned as to drive the wormwheel blank in the proper ratio to the hob.

In the position shown a blank may be put on the work



HOBBING THE WORMWHEEL

spindle without interfering with the hob. When the machine has been started all that is necessary is to depress the lever *I* attached to the swinging housing. This brings the blank into cutting contact with the hob and is continued until a stop set for the proper depth of cut arrests further motion. Raising the lever *I* brings the finished wormwheel out of mesh with the hob, when it can be removed and a blank put in its place.

The arrangement as shown is used for hobbing small bronze wormwheels in the shops of the Acme Machine Tool Co., Cincinnati, Ohio.

Cost Factors on a Large Welding Job

By D. C. Cook

The Reid-Avery Co., Philadelphia, Penn., recently completed a large job of electric welding, on which careful observations were made on the electric current consumption, time and electrodes required, as well as the preparation time such as grinding and chipping

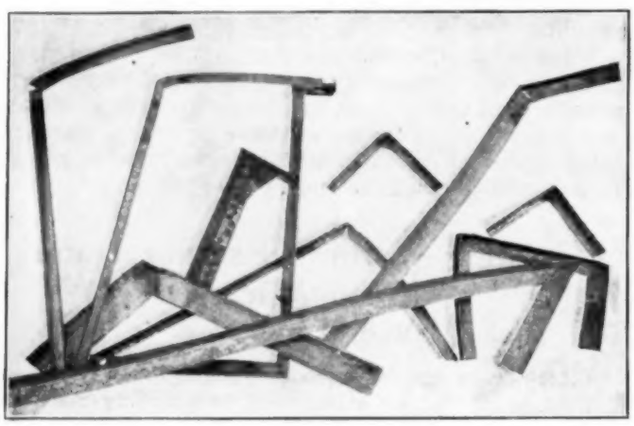


FIG. 1. A FEW OF THE WELDED SHIP ANGLES

and the activity of the welders. The job consisted of 4800 miscellaneous ship angles, of which those shown in Fig. 1 are typical.

In view of the great variety of welds involved, it was decided to base the observations on the factors of 116 representative welds, from which averages were obtained for the entire lot. On the 116 welds the current consumed was 450 kw.-hr.; the time required, 72.8 hr.; electrodes, 58 lb. The preparation time amounted

FIG. 2. WHERE THE JOB WAS DONE

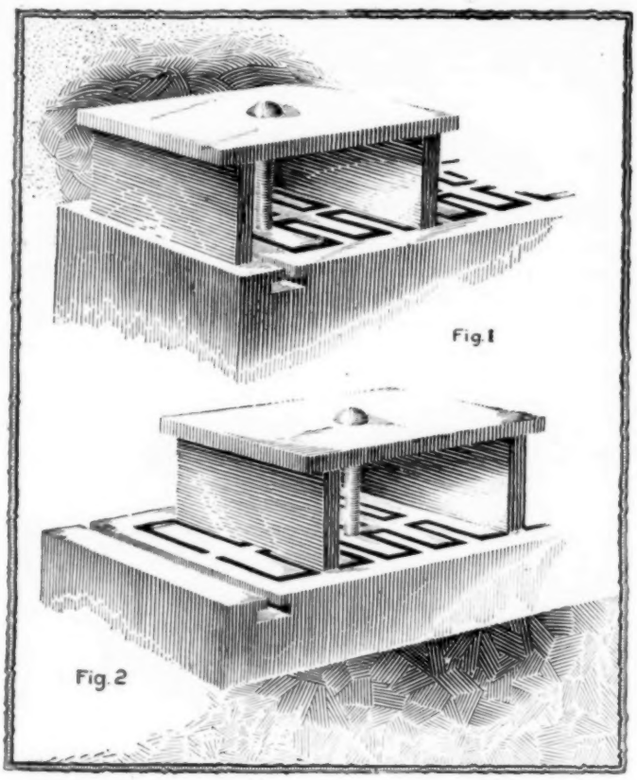
to 52 hr. The above figures are based on an actual welding activity of 33 per cent.

Fig. 2 shows the equipment used on the job, each welder being fully equipped with current regulation devices, mask and gloves for personal comfort and protection, as well as screens to protect the neighboring welders from side flashes.

Holding a Piece on Parallels on the Magnetic Chuck

By Joseph C. Fisher

When it is necessary to grind the bottom of a punch retainer or other piece, the under side of which is of such shape as to make it necessary to rest it on parallels, the magnetic chuck will not hold it unless one of the parallels is made to rest on the frame of the chuck



FIGS. 1 AND 2. RIGHT AND WRONG WAY TO HOLD A PIECE ON PARALLELS

as in Fig. 1, which provides a positive and a negative pole for the magnet. With the parallels in the position shown in Fig. 2 there will be little or no tendency to hold the piece.

I have asked several of the men in our toolroom if they could hold a piece like this on the magnetic chuck and the answer was that they could not. They evidenced considerable surprise when they discovered how easily it was done.

Figuring Diameter of Three-Surface Tangent Plug

By Wm. F. L. Dobbins.

I was greatly interested in the problems of the flush-pin gage by Cleveland C. Soper on page 1098, Vol. 50 of the *American Machinist*. While his formulas for Figs. 1 and 2 are correct, I think the following is much more simple and will be more readily understood by the majority of your readers.

In solving Fig. 2, I follow the rule that when two dividends each have divisors which are of the same ratio to their respective dividends their quotients are equal, and are also equal to the quotient of the sum of

the two dividends divided by the sum of the two divisors.

Example:

$$\frac{60}{5} = 12, \frac{72}{6} = 12;$$

therefore

$$\frac{60 + 72}{5 + 6} = \frac{132}{12} = 12.$$

As the tangent of an angle is the ratio of the side opposite to the side adjacent, it follows that where two adjoining angles have a side adjacent common to both, their side adjacent equals the sum of their sides opposite divided by the sum of their tangents. Therefore referring to Fig. 2 of Mr. Soper's problem, all the formula necessary is the following:

$$C = \frac{A}{\sin \theta} = D + F$$

$$R = \frac{C}{\tan \frac{\theta}{2} + \tan \frac{90^\circ - \theta}{2}}$$

For example, let A in Fig. 1 = 0.625 in.; angle θ = 30 deg.; angle $Y = \frac{}{2}$ = 15 deg., and angle $Z = \frac{90^\circ - \theta}{2}$ = 30 deg.

Therefore:

$$G = \frac{A}{\sin 30^\circ} = \frac{0.625}{0.5} = 1.25 = D + F$$

and

$$R = \frac{D + F}{\tan 15^\circ + \tan 30^\circ} = \frac{1.25}{0.26795 + 0.57735} = \frac{1.25}{0.8452} = 1.47876 + \text{in.}$$

Proof:

$F = R \times \tan 15^\circ = 1.47876 \times 0.26795 = 0.39623+$
$D = R \times \tan 30^\circ = 1.47876 \times 0.57735 = 0.85376+$
$C = D + F = 0.39623 + 0.85376 = 1.24999+$
$= 1.25000-$

We may take advantage of the same principle to find the side (A and B, Fig. 2) of a rectangle when the sum of A and B, and the angles Y and Z are known

Formula:

$$C = \frac{A + B}{\sin Y + \sin Z}$$
$$A = C \times \sin Y$$
$$B = C \times \sin Z$$

In Mr. Soper's solution of his diagram Fig. 4, he is correct so far as:

D = Diameter of standard plug,

$$T = A + B - \frac{D}{2};$$

$$B = \frac{D}{2} \tan \left(\frac{90^\circ - \theta}{2}\right).$$

which is all that is necessary, so why go farther?

His next equation,

$$T = A + \frac{D}{2}\left[\frac{\sin 90^\circ - \theta}{1 + \cos 90^\circ - \theta}\right]$$

is incorrect; the correct formula would be

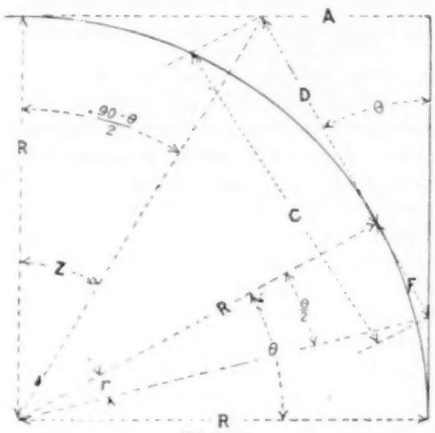


FIG. 1

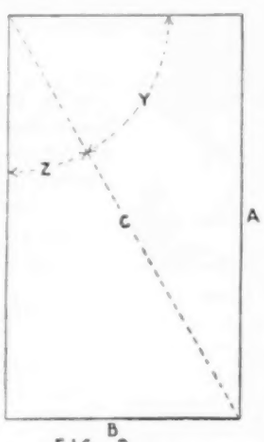


FIG. 2

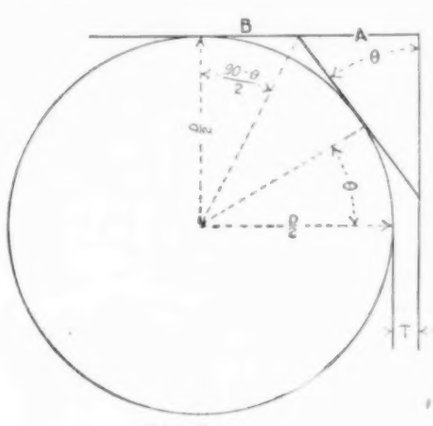


FIG. 3

FIGS. 1 TO 3. DIAGRAMS FOR FIGURING THE DIAMETER OF A THREE-SURFACE TANGENT PLUG

$$T = A + \left[\frac{D}{2}\left(\frac{\sin (90^\circ - \theta)}{1 + \cos (90^\circ - \theta)}\right)\right] - \frac{D}{2}$$

For example, in Fig. 3 let us assume that angle θ is 30 deg., dimension A to be 0.4 in. and diameter of plug to be 1.4 in.

Then

$$B = \frac{1.4}{2} \tan \left(\frac{90^\circ - 30^\circ}{2}\right) = 0.7 \times \tan 30^\circ = 0.7 \times 0.57735 = 0.404145 \text{ in.}$$

$$T = A + B - \frac{D}{2} = 0.4 + 0.404145 - 0.7 = 0.104145$$

and

$$T = A + \left[\frac{D}{2}\left(\frac{\sin (90^\circ - \theta)}{1 + \cos (90^\circ - \theta)}\right)\right] - \frac{D}{2} = 0.4 + \left[0.7\left(\frac{\sin 60^\circ}{1 + \cos 60^\circ}\right)\right] - 0.7 = 0.4 + 0.7 \times \frac{0.86603}{1.5} - 0.7 = 0.4 + 0.7 \times 0.57735 - 0.7 = 0.4 + 0.404145 - 0.7 = 0.104145.$$

Another correct formula would be

$$T = A + \left[\frac{D}{2} \tan \left(\frac{90^\circ - \theta}{2}\right)\right] - \frac{D}{2}.$$

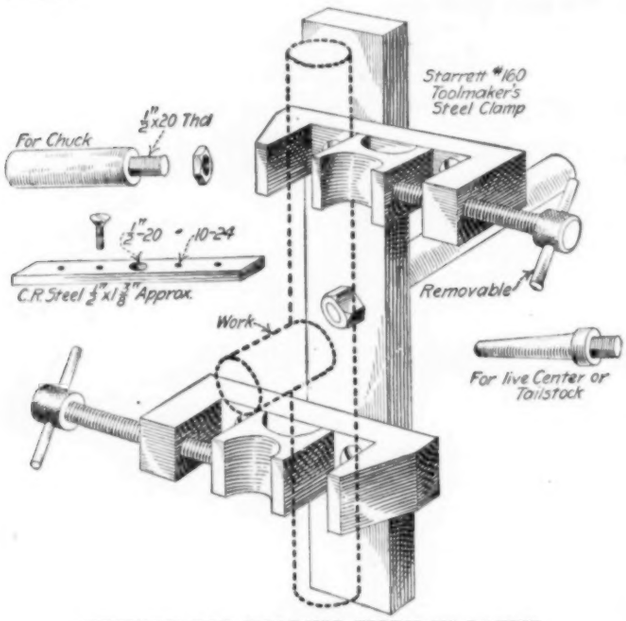
[The omission of the term $-\frac{D}{2}$ from the last two equations of Mr. Soper's article was a typographical error for which he is not responsible.—Editor]

Fixtures for Holding Work in Lathe

BY H. H. PARKER

The fixture shown in the illustration was originally used on a special milling attachment made for the lathe, but subsequently was found useful for special operations when held in the lathe chuck.

It consists merely of a steel plate with a cylindrical steel stub screwed to it and held by a locknut. The center line of the plate has a series of holes drilled and tapped for No. 10 machine screws, by which a pair of Starrett No. 160 toolmaker's clamps may be screwed to the plate at different distances from the center. These clamps hold the work and if they face in opposite directions, the center of the work will coincide with the lathe center.



FIXTURE FOR HOLDING WORK IN LATHE

Instead of being held in the chuck, or for holding the work in the tailstock for drilling, the stub could be tapered to fit the lathe centers.

The clamps will hold round or square work.

Broaches for a Keyed Bushing

BY FRANK A. STANLEY

The halftones, Figs. 1 and 2, illustrate a set of broaches for finishing the interior of a bronze bushing used in the front head of the coal plugger made by the Pneumelectric Machine Co., Syracuse, New York.

The bushing is 4½ in. long and $3\frac{7}{16}$ in. outside diameter as indicated in Fig. 3. It has two solid keys, ⅜ in.

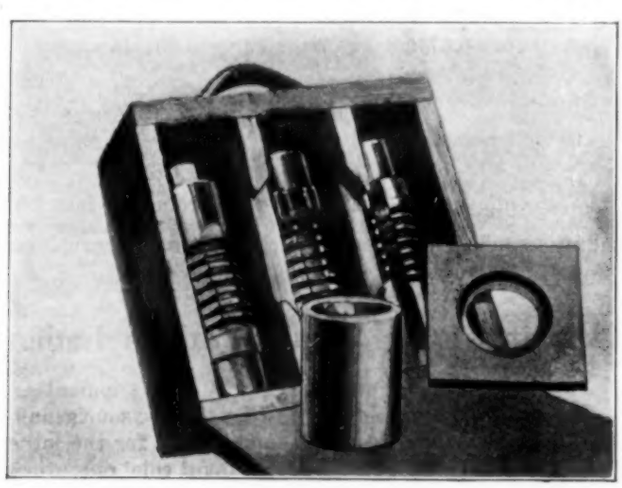


FIG. 1. THE THREE BROACHES IN THE CASE

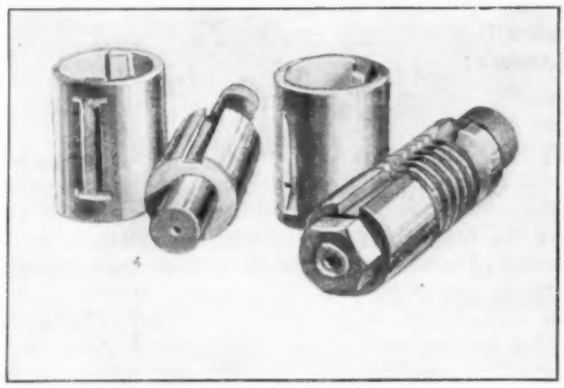
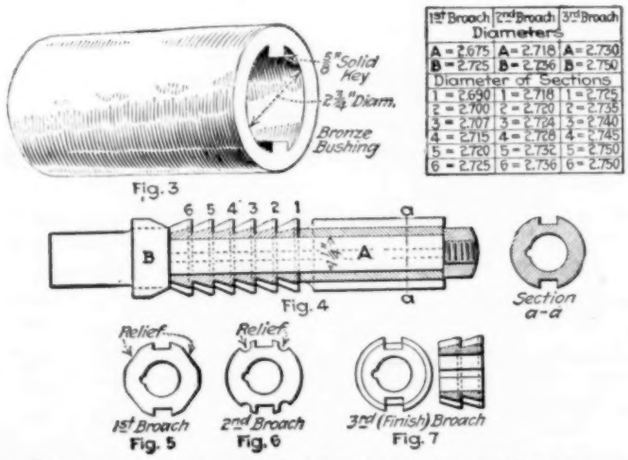


FIG. 2. THE FINISHING BROACH AND THE LATHE MANDREL

wide, formed in the bore and the only method at all practical for machining the inside is therefore by means of broaches. The set of three broaches is shown in its case in Fig. 1 with a guide plate and finished bushing in the foreground, while Fig. 2 shows the finishing broach and the lathe mandrel used in turning the exterior of the bushing concentric with the broached bore. The broaches are made up in sections as represented by the longitudinal section in Fig. 4. The broaches proper are disks made up in pairs, two cutting edges to a section, and the bores are ground out to fit snugly over the central body which is threaded at the leading end to receive a tightening nut for securing all parts in place. The faces of the broaching disks are ground square with the bore to avoid springing the central body when clamped in position.

The pilot on the first broach is small enough to enter the bushing and once in place the broach starts cutting at certain portions only of the circumference. Fig. 5 shows the relieved portions of the edge, only about one-fourth of the circumference being left for cutting on this first pass through the work.

The second broach, Fig. 6, is relieved with narrow half-round grooves on both sides of the rectangular keyway portions, but otherwise the edge is unbroken, thus covering the sections of the bore not rounded out by the first broach. The third, or finishing broach, cuts all the way around as indicated by Fig. 7. The table in the drawing shows how the work is distributed between the three broaches in the set.



1st Broach	2nd Broach	3rd Broach
Diameters		
A = 2.675	A = 2.718	A = 2.730
B = 2.725	B = 2.736	B = 2.750
Diameter of Sections		
1 = 2.690	1 = 2.718	1 = 2.725
2 = 2.700	2 = 2.720	2 = 2.735
3 = 2.707	3 = 2.724	3 = 2.740
4 = 2.715	4 = 2.728	4 = 2.745
5 = 2.720	5 = 2.732	5 = 2.750
6 = 2.725	6 = 2.736	6 = 2.750

FIGS. 3 TO 7. DETAILS OF WORK AND BROACHES

Fig. 3—The bushing. Fig. 4—Longitudinal section of one of the broaches. Fig. 5—Cross-section of first broach. Fig. 6—Cross-section of second broach. Fig. 7—Cross-section of third or finishing broach.

Contracts and Contractual Relations—

By CHESLA C. SHERLOCK

The importance of contract law cannot be overemphasized in the business and industrial world. What the law of contracts really includes can best be understood when it is remembered that fully one-half of the entire field of the law arises out of a contractual relation, either express or implied.

FROM the earliest times, particularly in the transaction of business, contract law has played an important part in the history of our development. And by no means a small portion of the litigation which business men have found themselves involved in has been due to a misunderstanding or misapplication of the rules which govern the contractual relation.

It is not possible in a limited discussion of this nature to even hint at all the phases of the contractual relation. We will therefore merely point out to business men the principal features of the relation as they apply to the usual transactions arising in every-day business affairs.

Because of the many relations out of which a contract may arise in business affairs, the subject matter has been divided and subdivided into many kinds and forms. In many instances, different rules of law are applicable to each of these kinds of contracts.

Oral and Written Contracts

In the first place, the most common division is into oral and written contracts. All business men are familiar with written contracts. They enter into them each day. They know that as a matter of evidence, defining the exact agreement at the time it was entered into, there is nothing better than a written contract.

At common law, the courts for a long time refused to enforce oral or unwritten contracts. They held, not to the theory that they were invalid, but rather refused to do anything because of the difficulty of establishing just what the contract had been. Gradually, a change in public opinion brought about a change in regard to oral contracts so that the courts had to take cognizance of them. But even then, for purposes of evidence, the courts established rules which have endured to this day respecting oral contracts. They said that oral contracts relating to certain forms of proper could not be enforced, unless something more than making the mere promise was done at the time.

Mere promises were not considered then as contracts and cannot entirely be said to amount to contracts today. It is, however, safe to say that a mere promise which is enforceable by law is a valid contract.

Then again, we find contracts divided into express and implied contracts. Just what this brief statement means is a matter which has been extremely confusing to many business men. Where debt was the matter in contention, all obligations which were actionable were regarded as contracts.

But the courts soon found that all obligations do not, in fact, arise from debt, so they could not say that they were contracts; so debt came to be superseded by assumpsit, a legal situation created to take care of those obligations which had not arisen out of a pure contractual relation.

The word "assumpsit," translated freely, means "he undertook to promise." Soon assumpsit came to be applied to purely fictitious cases where there had been no actual promise on the part of the defendant. It was then necessary to imply a legal implication of a promise in order to recover under the then existing rules of law.

This policy of implying a promise in order to fit the cause of action to the remedy has survived to this day in many varying forms. Where there has been an actual promise to pay a certain sum or do a certain thing, the contract is said to be express; but where there is no actual promise, it is said to be implied.

Where the promise can be implied from the conduct of the parties, it is said to be implied in fact, and where the promise is merely fictitious, it is said to be implied in law.

There is nothing mysterious about contracts implied in fact. Whenever the relation of the parties to an alleged contract is such that it is reasonably to be inferred that they, in fact, intended mutually to contract, we have a plain example of a contract implied in fact.

In the ordinary sense, the only difference between an express contract and a contract implied in fact is that under an express contract, the parties arrive at their promise either in writing or by words spoken orally, while in the case of a contract implied in fact, they arrive at their promise, not by actual affirmative agreement, but by the natural implication which arises from their acts and relations regarding the matter.

Cases in Point

In a California case, it was said that the only difference between an express and an implied contract was that in the express contract all the terms and conditions of the agreement were expressly set out; while in the case of an implied contract some one or more of the conditions had to be implied by law from the subsequent acts of the parties.

In a Federal case, it was said that if one party performs a service for another, with the assent or knowledge of the latter, who did not protest while the service was being performed or availed himself of it, if such service was customarily paid for, a promise to pay a reasonable value for such service is implied.

Likewise, if a manufacturer installs machinery on the promises of another, and the latter avails himself of its use and adopts it as a part of his equipment and so treats it, there is an implied contract on the part of the latter to pay the manufacturer for it.

In New Hampshire, it has been said that the service rendered must not merely have been a gratuity, and in Indiana, it is added that the person performing the service must show that the person benefited has done

something from which a promise to pay can be inferred.

In Maryland, it has been said that a contract will not be inferred where the facts are wholly inconsistent with the contract to be implied, and in California, it has been said that no contract will be implied which would be contrary to law.

It has been noted that in both express and implied contracts, as a rule, the obligation is founded upon consent. In fact, it seems to be a general conclusion on the part of everybody that contracts are founded upon consent. This is not always true, especially in the case of contracts implied in law. These contracts are technically spoken of as *quasi* contracts.

One authority has said: "They are contracts in the sense that they are remediable by the contractual remedy of assumpsit!"

These contracts arise entirely from implication of law due to the facts and circumstances surrounding the case. The law pays no attention to the intention of the parties. What they have done is the sole criterion in that direction. In an Illinois case of consensual contracts, the agreement defines the duty, while in the case of *quasi* contracts, the duty defines the contract. This is about as clear an explanation of the difference that can be given. Whenever the relation of the parties or their actions are such as to create a legal duty a contract will be implied that they intended to fulfill this duty, regardless of what their actual intention or desire might have been at the time.

It must be remembered, however, that there must be a valid consideration to the contract. The law does not imply in any case the consideration; it implies only the promise. The other elements of a valid contract, which will be discussed later, must be present in order to bind the parties to any implied contract.

Contracts Should Be Reduced to Writing

This should, of course, be a sufficient moral to those who have agreements to make to reduce them to express terms, preferably in writing. While it is doubtless the desirable thing to do, all men do not do the desirable thing at the proper time. There are probably as many implied contracts finding their way into the courts as there are express contracts, and for that reason no conscientious business man can consider himself grounded in contract law until he has mastered this phase of the subject.

Oftentimes, it is urged that contracts may be express in part and implied in part. But this is entirely absurd. In a Connecticut case, it was pointed out that it is only where parties do not agree that the law interposes and implies a promise. They cannot promise as to part and give implication to part any more than two solid bodies can occupy the same space at the same time, as another authority points out.

In a Massachusetts case, it was said that the generally recognized doctrine is that it does not follow from the fact that a contract is invalid, because the minds of the parties did not meet as to some of the essential terms thereof, either because of a mutual mistake or uncertainty therein, that a party thereto who furnishes material or renders services to the other party, relying upon the terms as he understood them, is without a remedy. The promise to pay a reasonable value for the services or the material in this case is implied.

Contracts founded upon consent, or consensual contracts as they are called at law, are divided into executed and executory contracts. In the previous distinctions which we have considered, the distinction was due to the amount of evidence necessary to prove the existence of the contract. In the case of consensual contracts, the difference between executory and executed contracts is not based upon the evidence necessary to establish it.

The United States Supreme Court has said that an executory contract is one where a person binds himself to do, or not to do a certain thing; while an executed contract is one in which the object has already been performed.

In other examples, it has been pointed out that an executory contract is one requiring affirmative action for its establishment, while an executed contract is one which has already been completed and will stand until disaffirmed.

Void and Voidable Contracts

Another common division of a certain class of contracts is void and voidable contracts. A great deal of confusion has arisen in this class of contracts because there has been a tendency, even on the part of the courts, to confuse the meaning of the two terms and an attempt to use them interchangeably.

The law, because of certain standards of public policy, has declared that contracts relating to certain subjects will be void. This means nothing less than that they are an entire nullity. They create no obligation on the part of either party. So far as the law is concerned, the parties to the contract and the subject matter thereof remain in precisely the same position they did before the void contract was entered into. It is a contract which cannot be enforced in any way at law.

In a long line of cases, the courts have said that a contract wholly void is void as to everybody whose rights would be affected by it if it were valid. In a Michigan case, it has been held that where one or two provisions of a contract are void that the parties may avoid the other provisions which are not void. This simply means that any contract which contains even a small portion of matter deemed void at law, is not only void in this offending portion, but void in its entirety.

On the other hand, a voidable contract is one wholly binding upon one party and binding upon the other until he repudiates it. It stands and binds both parties until it has been disaffirmed by the party having a legal right to avoid its terms. A good example of avoidable contract is where a business man enters into a contract with a minor. In the majority of cases, a minor's contracts are voidable; that is, he may repudiate them when he becomes of age. As to the other party, however, they are as binding and may be enforced to the same extent as an ordinary contract between persons having capacity to contract.

Another distinction which might well be observed is that in void contracts, the fatal defect is in the subject matter of the contract. It is something which the law has said could not be contracted about. While in the case of voidable contracts, the fatal defect is not in the subject matter of the contract or its purpose, but rather in the capacity of one of the parties to contract.

Contracts are often further divided into unilateral and bilateral contracts. Ordinarily, it is a theory of law that no contract can be treated as such unless there is a mutual obligation on the part of the parties. This is not altogether true else we could not enforce unilateral contracts at law. These contracts, such as options, a contract evidenced by a subscription paper, or one to enforce a reward offer, or a guaranty, are very common in the business world today.

The courts have said that if the promisor agrees to do a certain thing upon the performance of a condition he sets out, that if a promisee subsequently performs the condition, that he can enforce the promise against the promisor even though there was no mutual obligation between the parties at the time the original promise was made. There was sufficient consideration to bind the promisor to his promise, in the opinion of the courts and as soon as the condition is performed it goes back and clothes the whole transaction sufficiently as to make it enforceable by the promisee whoever he may be.

In the case of bilateral contracts, the parties have undertaken to enter into a mutual relation whereby obligations and duties are mutually entered into. Something must be done on both sides before the purpose of the contract has been accomplished. In such kinds of contracts, the courts are agreed that mutuality is an important element and that the contract cannot be enforced if there is not a mutual obligation between the parties.

Summary

We have found, then, the principal divisions of business contracts, by which we mean those commonly encountered in every-day affairs, to be:

(1) Contracts express and implied. There are two kinds of implied contracts. Those implied in fact and those implied in law.

(2) Contracts implied in law are called *quasi* contracts.

(3) Executory and executed contracts

(4) Void and voidable contracts.

(5) Unilateral and bilateral contracts.

In the next discussion, we will take up the elements of business contracts and explain their features, in the light of the leading decisions.

German Machine-Tool Competition in Holland, Belgium and France

This letter from a Rotterdam correspondent of R. S. Stokvis & Zonen, Ltd., gives a vivid picture of the post-war dumping of German machine tools. What are we going to do about it?

WE HAVE here in Holland conditions such as have never been seen in history and which very probably will never come back again. It is as if at present Germany is liquidating everything she can sell at any price if she only can import food in return. The mark has fallen down to a never-thought-of low value. Today the mark is worth less than two American cents, and all kinds of machinery are offered in mark values at a price, perhaps two to three times as many marks as before the war—but with the mark one-twelfth of its value. It looks as if the Germans have decided to quit industry because machine tools are imported into Holland in such quantities as had not been thought available in Germany. They are not imported by millions of marks, but by *milliards* of marks. Trainloads are unloaded in the open air and sold in the street like toys on Broadway. In a meadow near Utrecht are about 5,000 machine tools in the open air, uncovered, and sold to anybody who is willing to give a handful of marks for them. As machine-tool dealers, we are offered lathes, shaping, planing, and upright drilling machines in lots of 300 and 500 at a time.

A good-looking German lathe with lead screw and separate feed shaft is offered for M. 5,000, which means Fl. 250, equaling $80. A bench sensitive drilling machine complete with a kind of Jacobs' chuck (500 at a time were offered yesterday from stock) sells at M. 70, which means Fl. 3.50, or about $1.25; so the whole machine was much less than the value of a Jacobs' chuck.

A 25-in. shaping machine sold at M. 2,000, equal to Fl. 60, or $20. A toolroom grinding machine of the same size and kind as those made by the Cincinnati Milling Machine Co. and the Greenfield Machine Co. sold at M. 2,400, equal to Fl. 120, or $40.

From the above you will see how really ridiculous the prices are at which German machine tools can be bought. The quality is below the pre-war mark, but to say that they are good for nothing would be wrong. When we offer today an American machine tool in guilders, the customer does not say, "That machine would cost me Fl. 5,000," but he says, "That equals M. 100,000." As long as that business goes on here there is no question of the legitimate dealer doing any business worth mentioning. German lathes which were offered us nine months ago at Fl. 1,200, were considered cheap; but we can buy the same lathes today for Fl. 200.

Machine Tools on the Bargain Counter

This thing will pass over. It is to be considered like a heat-wave, but meantime we have to stand the heat of this queer dumping. What is worse, however, is that at present nearly every manufacturer here buys not because he has needs but because tools are so cheap that even if he does not want them, in three or four years' time, he has a bargain anyhow. And so most of the manufacturers are anticipating their needs for years to come.

It is for the writer personally, who has given so much of his life to have the high-class American machine tool introduced and used in our country, a hard thing that at present Holland is overflooded with the lower-class German tools. Though at present it looks as if Holland is making a bargain by it, we fear that it will set our industry back for years to come, because the manufac-

turers will try to use these machines and by so doing put back real modern production methods.

Though not to quite such a large extent, the same conditions exist in Belgium. Just as here, most of the regular dealers abstain from this present funny gambling, but the Belgian manufacturers and the French as well, are sending their representatives to Germany and buying what they can get at very cheap prices, because of the low rate of exchange between German currency and Belgian and French francs. This comes at a time in Belgium when industry is again in the market for machine tools, having been waiting for quite some time to see what the Belgian commission sent to America could get for their needs. As you know, the American Government put at the disposal of a Belgian commission a large number of machine tools at rather low prices and with long credits, and the Belgian manufacturers were awaiting what that commission could get for them. This is about over now so that the Belgian industrials will have to look to the regular sources of supply and we have already, by some nice orders, seen that there are going to be normal conditions again in Belgium, but this German dumping, in the case of many manufacturers, put an end to proceedings with regard to the buying of American machine tools from the regular agents. There are, of course, many Belgian and French industrials who, even if they could get it for nothing, would not think of buying German material, but a large percentage think and say: "Business is business, and I buy my stuff where I can get it cheap." Even the French Government pronounced this in a circular to industrials in France, encouraging them not to buy from America, but to go to Germany and take advantage of the low rate of exchange, promising the French industrials every facility as to viséing of the passports and the free movement in Germany of the representatives.

Commercial World Upset Over Exchange Being Out of Balance

The whole commercial world is upset at present because the exchange is out of balance all over the world. Compared with America, Belgian and French francs are very low, about half their normal value. Compared with Dutch currency, Belgian and French francs are low, and the guilder high, but if you take the high guilder compared with the franc, it is low compared with the American dollar. If you take the low franc compared with the Dutch guilder, which in its turn is low compared with the American dollar, that same franc, doubly cheap compared with Dutch and American currency, is top-high compared with the German mark and Austrian crown. And so it is no longer a question of what you are willing to buy, but the relation between the different currencies which causes the buying movements in the one or the other direction, and though a country like yours or ours may be proud about the high mark of their currency, it turns to be a nice knife which cuts one's self! The low value of the German mark is still lower than *you* consider it to be, for in Holland, to say that a mark is two American cents is not right, because the Dutch guilder, which usually is worth 40 American cents, today is only worth about 35 American cents. When the German mark and the American dollar were put next to each other in Rotterdam, before the war, the comparison was M. 4 was equal to $1; at present $1 is equal to M. 53 and that, of course, kills business with America and hurts the United States.

What we are going to give you is only a short synopsis. You will understand that because of circumstances as described above, so many conditions are arising that one could write a book about it. The whole world, and especially Dutch, Belgian and French people are discussing the reason, and one hears all kinds of surmises. The one says it is because the commercial balance of the exchange of goods is very much against Germany, and therefore because they have no gold to export the mark must go lower and lower, but seeing the enormous dumping of Germany, many say, "No, it is because the real value of the mark in Germany proper has to be discounted." But yesterday we heard another surmise.

One Bank in Holland Sells Eighty Million Marks Each Day

A business man of importance assured us that one bank alone in Holland sells every day in Holland eighty million marks, and has orders to sell them at any price, and his surmise was that Germany, having to pay the Allied Powers a hundred thousand million marks, has a big interest that that mark be very cheap. If they can reduce it so that instead of M. 4 equaling a dollar—say M. 400 equal a dollar to take an example—that would mean that in reality, instead of having to pay the Allied Powers a hundred thousand million marks, they will only have to pay them a thousand million marks; and with regard to Germany proper, it is in the interest of the German Government as well. He said, "Take a regular employee here in the office with a salary of M. 3,000 per annum, of which, on account of the present enormous debts of the German Government, he would have to pay M. 1,000 taxes. The man could not do it or would become a revolutionary, but if the man, because of the low value of the mark, gets a salary of M. 30,000 per annum he can easily pay that same M. 1,000."

You will see from the above that what happens at present in the central countries is a puzzle, no matter from which side you look at it but what we know for sure is that at present it makes a regular business in American machine tools an impossibility. Truly yours,

R. S. Stokvis & Zonen, Limited.

An Expensive Clamp

By George P. Pearce

There was a near riot in the shop the other day and this is how it happened: Tom Fellows, who is a first-class toolmaker, was drilling some holes in a jig at the sensitive drilling machine, and, finding he wanted another drill, he left the jig and his micrometer on the machine table while he went to the toolroom.

While he was away Jake, the helper, came along and wanted to drill a hole in a piece of brass plate. He started in and almost got the hole through when the drill "caught" and spun the plate around, cutting Jake's fingers.

Jake stopped the machine and, looking around for something to hold the plate, spied Tom's micrometer which looked to him to be a good tool to clamp things with, so he proceeded to clamp the brass plate good and tight so it could not slip again. He was calmly drilling once more when Tom returned and saw his micrometer acting as a clamp, whereupon Tom said things utterly unfit for publication. The foreman finally compromised the situation by requiring Tom to pay 25 per cent toward a new one as a penalty for being so careless as to leave his mikes lying around, and Jake to pay 25 per cent for monkeying with things that he had no right to. The department paid the balance.

Testing Hacksaw Blades

By HOWARD H. GEORGE
Assistant Engineer, Public Service Railway Co.

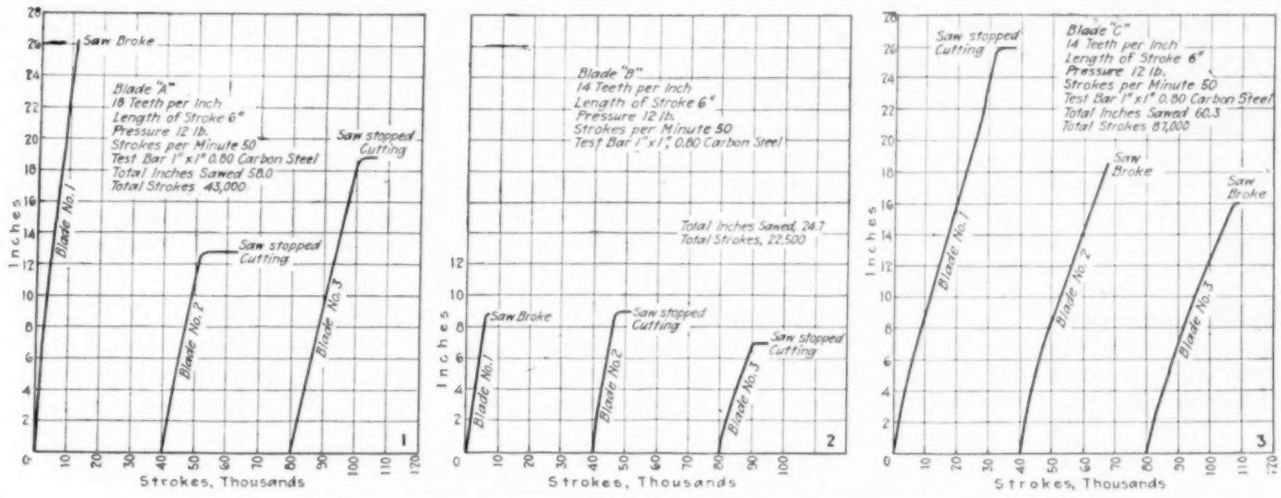
A well-known engineer once said to his staff, "Opportunities to figure out a way to save the company money are staring you in the face every day, and, if you are only wise enough to recognize and take advantage of them, you can make yourself and your department invaluable to your employer." Here is a case in point.

SOME electric railway companies have been inclined to regard the engineering department as a liability rather than an asset and, in a few cases, such an attitude may have been justified. This is perhaps due, to a large extent, to the fact that the principal function of the engineer is to plan and supervise the construction of work which generally involves the expenditure of considerable sums of money, and, too often, the real value of a high-grade engineer in securing a safe design and an economical expenditure of the money is overlooked. But there is another very large field in engineering which should not be overlooked when criticising the profession, in which, if he utilizes his opportunities, the engineer may be of real value to his employer.

The writer has seen and prepared specifications for many track materials but, although thousands are used every year on all railway properties of any size, he has never seen a railway company specification to cover hacksaw blades. It is true that many companies do submit samples of the blades they are using or contemplate using to so-called tests, but the latter are too often made in such a way as to have no real value whatever. As a general thing such testing was limited to a distribution of the samples among the various roadmasters to be "tried out." These men, in turn, handed them to various foremen who turned them over to a track laborer to use. "Reports" were then transmitted to the superintendent showing the "results" of the test, and it was but rarely that two reports would agree as to the merits or value of the same blades. The reason for such adversity of opinion should, of course, be obvious, as should also the worthlessness of such "tests" for comparative purposes.

A hacksaw blade, in itself, may seem like a very trivial article and not one on which very much money might be saved, but a careful analysis of its use should prove that this is not true, and that an occasional test is well worth its cost in order to insure the purchase and use of the blade which will cut the most metal in the quickest possible time. For in these days of high labor rates, this item will generally amount to more than the value of the blade itself.

Some time ago, during a visit to the factory of a manufacturer of testing machines, the writer was shown a machine for the automatic testing of files in which an autographic record of the result of the tests was obtained. The large number of hacksaws being used on the property on which he was employed had previously appealed to him and the thought occurred that such a machine could easily be adapted to the requirements of a suitable test for hacksaw blades. The proposition was put up to the firm and they agreed to equip the machine and make the tests and, the approval of the railway company's management having been obtained, they were arranged for. In view of the present publicity being given to the necessity for economy in every direction, it was thought that the results of these tests might be of sufficient value to bring them to the attention of the many users of hacksaw blades. The results obtained in this test were no different from what might be expected on any property, and it is believed that they are well worth a careful study and analysis by any extensive user of hacksaw blades.



FIGS. 1 TO 3. AUTOGRAPHIC TESTS OF SAWS A, B AND C

There are many different ways in which comparable tests of hacksaw blades may be made, but it is the writer's belief that the most scientific method and the one which gives the only satisfactory and conclusive results, is one in which the blades are all of the same dimensions, have the same number of teeth per inch, or as nearly the same number as possible, and where every blade is tested to the point of destruction; that is, where the blade no longer cuts. To obtain comparable results,

all the blades must be tested in the same machine, at the same length and rate of stroke, the same tension, the same pressure, and must cut the same cross-section of metal from the first stroke till the last. It would also seem desirable that the metal upon which the test is being carried out should approximate, as closely as possible, the characteristics of that in the rail or other steel on which the saws are to be used in actual practice. The test specimen was a steel bar 1-in. square having as nearly as practicable the same chemical analysis as our rail, the same steel being used for every blade. The cut was made lengthwise of the bar so that all saws were at all times cutting through a 1-in. section of metal. This insured that the rate of cutting at any time would be comparable in the case of every saw tested, and permitted the test of all blades to be made on the same bar.

TABLE I. COMPARATIVE ANALYSIS OF RESULTS OF TESTS OF HACKSAW BLADES

Make of Blade	Total Inches Sawed	Total Number of 6-in. Strokes	Average Cut per Stroke in Inches	Total Cost of Blades	Cost of Blades per Inch Cut	Total Time Consumed in Minutes	Time in Minutes per Inch Cut	Total Labor Cost at 18½c. per Hour (Rate Assumed)	Labor Cost per Inch Cut	Total Cost per Inch Cut	Relative Cost per Inch Cut (Cheapest = 100%)	Relative Amounts Cut by 3 Saws (Max. Cut = 100%)
"A"	58.0	43,000	0.001349	$0.11979	$0.00207	860	14.83	$2.6511	$0.04571	$0.04778	109.31%	92.95%
"B"	24.7	22,500	0.001098	0.11811	0.00478	450	18.22	1.3875	0.05617	0.06095	139.44	39.58
"C"	60.3	87,000	0.000693	0.11250	0.00187	1740	28.85	5.3650	0.08899	0.09086	207.87	96.63
"D"	53.1	66,500	0.000798	0.13188	0.00248	1310	24.67	4.0386	0.07606	0.07854	179.68	85.09
"E"	62.4	42,300	0.001475	0.11901	0.00191	846	13.56	2.6085	0.04180	0.04371	100.00	100.00
"F"*	45.9	81,800	0.000561	0.11500	0.00251	1636	35.64	5.0450	0.10991	0.11242	257.19	73.56

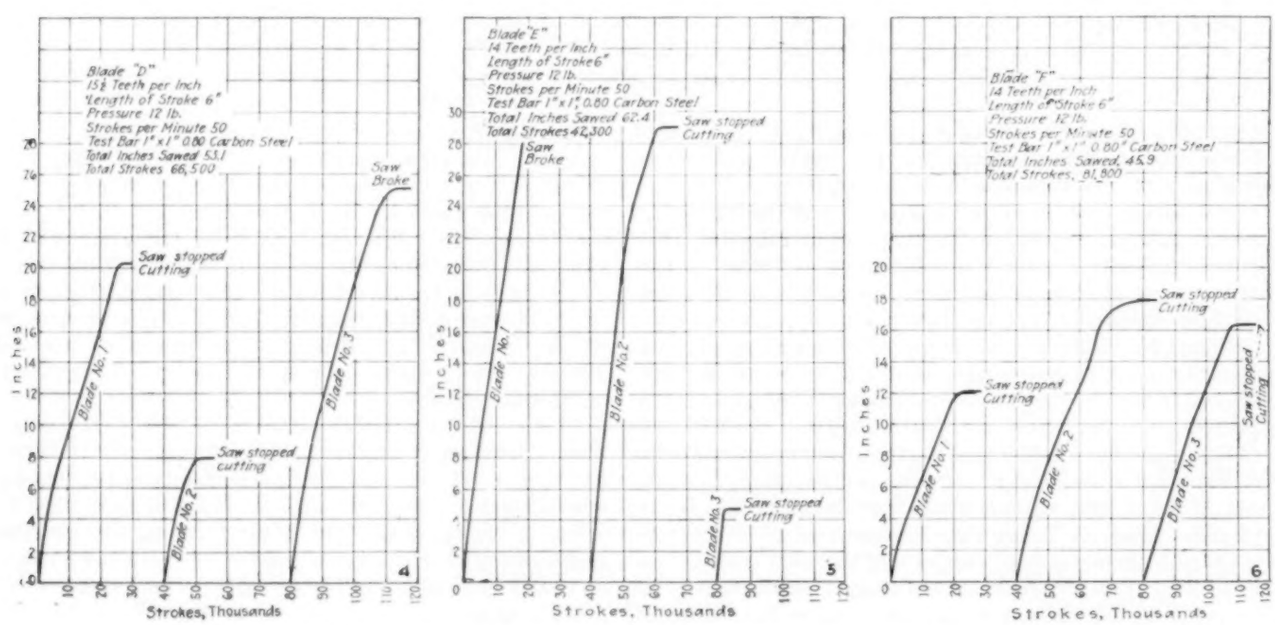
* Special Tungsten Alloy Steel.

A saw that would give entirely satisfactory results on an ordinary rail might fail miserably on some tool steels.

In the actual tests referred to, every effort was made to eliminate the personal element and the greatest care was taken to insure uniform conditions throughout, so that any part of any test could be duplicated at any time. Manufacturer's samples, with but one exception, were not used but the blades tested were either taken from our own stock or were purchased from jobbers' stocks. In the exception referred to, the test of these blades showed them to be the least efficient of all, so there could be no claim made that the blades developing the highest efficiency were "doctored samples" especially prepared for the test.

Six different makes of blades were tested, three of each being tested to the point of failure. The pressure was obtained by means of a weight suspended over a pulley and its amount was determined by a few preliminary experiments. In each case, the cutting was done on the forward stroke only, the saw being automatically raised on the backward stroke. Care was taken to see that the tension was the same in all cases. The length of stroke and the rate was kept uniform, and the number of strokes was recorded by a counting device attached to the machine. The autographic chart was adjusted around a vertical drum so connected as to rotate uniformly a fixed amount for each stroke. The pencil point was held in a device which moved upward on the chart at a rate depending directly upon the rate of cutting of the blade. In tabulating the results, for obvious reasons, the names of the makers of the various blades have not been referred to, the different manufacturers' blades being designated by a letter, individual blades being numbered.

It is believed that the test itself showed the relative efficiency of the various blades submitted to it beyond question. In comparing the results obtained, a value of 100 per cent. was assigned to the blade making the best average showing and the value of all the others was reduced to this basis, as shown in the accompanying table. The cost of the blades was based upon actual quotations at the time of the test, based upon an order for all the saws required for a year. In order to apply the results of the test to actual field conditions to determine as



FIGS. 4 TO 6. AUTOGRAPHIC TESTS OF SAWS D, E AND F

closely as possible what the amount of saving would be by using the most efficient saw, a number of observations were made in the field to determine approximately how long the old make of blades were serviceable before being discarded. The average time was in this way fixed at about 30 min. of actual cutting. The rate paid for labor at the time of the test was 18½ cents per hour, and upon this basis it was determined that, other things being equal in both cases, the use of the most efficient cutting saw (based upon a total requirement of 455 gross per year) would result in a labor saving of over $5000 per year.

The test showed that the blade making the best showing did the same amount of work as that with the poorest record and more than two and one-half times as quickly (see column 8 of table); therefore, it is evident that the difference in time would represent the labor-saving due to the use of the most efficient blade. In addition, the saw showing the greatest efficiency cut a total of 36 per cent. more metal than the saw with the lowest efficiency. This means that the same amount of work could have been done with the most efficient saw with the use of about 26.5 per cent. less saw blades, which in the case referred to would have meant the saving of the cost of about 120 gross of saws per year. In order to see that the saws being supplied continue up to the standard of the specimens used in the tests, additional tests of blades taken from stock should be made from time to time; but this is true of all tools or materials and is not peculiar to saw blades.

Less Scrap and More Production

By John R. Godfrey

Johnson is introducing a "spoiled work" campaign—not to raise the percentage as you might pessimistically imagine, but to wipe it off the books. Of course, he doesn't expect to get into the hundred per cent class in this, but he's cutting it down and learning several things about his machine equipment, his foremen and his men at the same time.

Spoiled work doesn't just happen—there's a reason, as the ads say. And it's Johnson's notion that it pays to find the reason and remove the cause—if possible. Hence the campaign.

Being a great believer in publicity, he staged another exhibition and sent me an invite and, being in town, I naturally dropped around to see the show. And it was *some* show—with a lot of food for thought as well as for the foundry scrap pile.

Johnson had been saving up a fine collection of scrap for some time—not for its amount, but for the variety of causes which lay behind it. (Johnson's strong on reasons and becauses.) Then he arranged it in fairly small groups—sort of sample boards of how *not* to do it—when the pieces were small enough. The larger pieces he had fixed up to show the defects to their best advantage. Where the "botch" was inside a casting, he had the metal all around it painted white as a background to show it off in all its glory.

Many pieces were tagged to tell what ailed them, what caused the trouble and how it could be avoided. Defects of all sorts were shown and it made a striking exhibit of the frailties which beset the average machine shop.

These exhibits were placed where they could be easily inspected at noon and there was a goodly crowd around them when I got there. No names were on the pieces but every man knew his own handiwork and it isn't Johnson's idea to call a man down in public for anything. And the men appreciate it.

"It's at least half our own fault in most cases when a man spoils a piece of work," Johnson told me. "We don't stop to realize that too few of the men have had real training as we used to know it. Foremen are too busy in most cases and training departments are all too few and far between. So I'm going to have a little smoker tomorrow night and have some of the best men we have tell us just how these things happened and how to prevent them.

"There's no lecture hidden away and the boys know it. They're just as anxious for a low percentage of scrap as I am, because they're taking a real pride in the job and there's a bonus in it also for lowering the scrap average.

Paying Men for Not Spoiling Work

"The next show of this kind we stage I'm going to put a price tag on every piece. I want to show the cost of the material, the waste of labor and the total cost to the company. One of the great troubles is that men don't know what things cost and it's up to us to tell 'em—and tell 'em the truth about it too. The old system of fines is bad in every way and it doesn't get anywhere in the long run. Paying men for not spoiling work is a heap better for all concerned. It's more effective and leaves a better taste in the mouth.

"There's more work spoiled because of disturbed mental conditions than anyone realizes. A sick wife or kiddie, lack of coal, the loan shark and even a plain grouch over cold pancakes, may all make a skilled man slip a cog. That's one of the reasons I try to get the wives and families interested in the shop and its work. It adds to a man's pride in his work and that of itself is a big factor in reducing wastage.

"Then too, Godfrey, old man, it's the most economical way of boosting real production—and we sure do need production all over the world. We hear a lot about men holding back in the shop and I presume it's true in some cases. But I'm dead sure you'll find a case of strained relations or lack of understanding at the bottom of it. It's a bad thing to throw a monkey wrench in the gears of any machine, but the fellow who puts the wrenches where they will be handy, or furnishes reasons for throwing them in, isn't altogether blameless.

"You and I have both known shops where the management had heart failure if a man earned 10 or 15 per cent over the regulation wages. Always fudged up some excuse for cutting the piece rate so he couldn't earn 'too much.' We both know it only takes a few such cases to make any man with an ounce of gray matter hold back, if necessary, so as not to earn more than the limit. We've even known 'em to tuck away a few pieces under the bench to help out the average on a day when they don't feel just up to scratch.

"We've both been in the shop, Godfrey, and we know that we'd do the same thing under the same circumstances. And we know we'd blame the management which made us hold back. It's a dern poor kind of management, between you and me, and I don't propose to have it around here as long as I have my usual amount of horse sense left. And I don't mean to give the boys any good excuse for even holding back on the job. If they do—I'm the guilty man and I won't try and lay it on them either."

This production game has several sides and Johnson knows it—and best of all he's trying to play fair.

EDITORIALS

Guaranties Against Price Reductions

SHOULD the sale price of an article be guaranteed against decline? If it should, for how long a time should the guaranty endure? What action on this problem is to the best advantage of the manufacturer? Of the dealer? Of the consumer?

These are some of the questions to be settled by the Federal Trade Commission at a series of hearings to be held in the near future. They are of sufficient importance to machine-tool makers and dealers to warrant careful consideration.

At the request of the commission we are taking this means to inform our machine-tool friends of the coming hearings and to urge them to take advantage of the opportunity to express their views. An extract from the circular letter sent by the Federal Trade Commission and signed by the chairman, Victor Murdock, follows:

FEDERAL TRADE COMMISSION
Washington, 26 December, 1919.

Gentlemen:

This question of guarantee against decline in price has been the subject of so many complaints before the Commission and opinion seems to be so diverse that the Commission has determined to go into the whole matter thoroughly.

As a basis for the necessary expenditures attending upon such an inquiry, such formal complaints have been issued presenting various phases of the subject. To the end that every party at interest may be fully represented, the Commission is inviting, generally, producers, manufacturers, merchants (wholesale and retail) and consumers, to declare their interest so that the Commission may know what parties should be represented.

As soon as this list of the parties at interest in the matter can be compiled, it is the purpose of the Commission to invite each or any of them to submit his observations in writing. This follows the custom of the Commission in numerous other similar cases.

A reasonable time limit for the filing of written statements will be given, after which they will be assembled and, as far as possible, classified, and each correspondent will be furnished with a copy of the whole document.

As soon thereafter as is possible, it is the purpose of the Commission to call a general hearing at Washington at which parties at interest may be present in person, by representative or by counsel, and an orderly method for hearing the matter will be laid out.

As in everything where the public interest is involved, the utmost expedition consistent with care and full opportunity for the presentation of all sides, is to be desired.

Keeping Our Foreign Markets

AMONG the problems which face us during the coming year—and they are many—is the problem of export trade. Do we want it and, if so, what are we going to do about it?

The domestic demand for machine tools is so great that most shops are much behind on orders. And this is practically a cash business, while export trade, to the countries of Europe at least, must be on some sort of a credit basis. Shall we neglect even a part of our domestic cash business in order to supply Europe with machines on time payments?

But the answer is not so simple as it seems. In normal times, before the great war, we exported approximately 25 per cent of our machine-tool output and were very glad of such a market. Shall we allow this outlet for 25 per cent or even less a proportion of our product to slip away from us?

* * *

There are still other sides to this question also. The sooner Europe can get a firm manufacturing basis, the sooner can she pay back our loans and afford a stable market for our product. And if Europe does not recover quickly enough to prevent financial and political chaos, it is bound to involve us as well. Such a disaster can sweep over the 3000 miles of ocean even more readily than did the scourge of influenza, which took more American lives than did the nineteen months of war.

Unless we look beyond the present and even the immediate future, we are courting trouble. We must help the manufacturers of Europe re-establish themselves for the sake of world peace and prosperity. We have too long failed to realize that, whether we like it or not, we are not and can never again be an isolated nation. We must play the business game as part of the world, not as a provincial community.

Foreign business is not a thing to be put on and off like a mask or a glove. If it is worth having, and we have spent a lot of money freely in the past to get it, it is worth cultivating and attending to all of the time. The immediate domestic dollar should not blind us to the return of export trade in the years to come. Only the fly-by-night concern can afford to kill the goose that lays the golden eggs. The man who is building his business for the future cannot afford to take any such chances.

* * *

Some long-headed managers are making their plans for the years to come. They are diverting a certain percentage of their products to their foreign customers, even on long-time credit, instead of taking cash from domestic buyers. This keeps their machines constantly going into the reorganized shops, so that more and more workmen will become familiar with them as time goes on. They are building for a future demand which will come in very handy when the home orders take their next drop in volume.

These managers know that unless they do this, unless they send machines across on terms which can be met, other machines from other countries will take their places, men will become accustomed to them, and it will be difficult to secure this market when it is needed. They are building for the future. Is there any other safe way?

SHOP EQUIPMENT NEWS

-Edited by-
E. L. DUNN and S. A. HAND

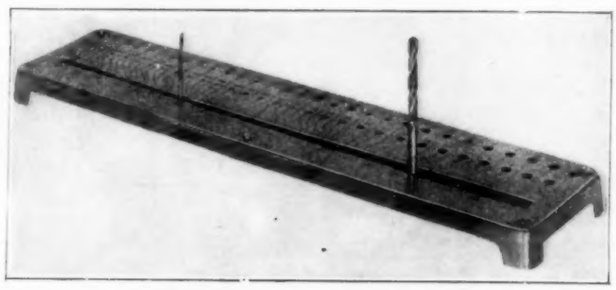
SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and equipment

Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs and equipment

"Quickbak" Gage and Drill Holder

The combination gage and drill holder just introduced by Russell & Burr, 716 Land Title Building, Philadelphia, Pa., will serve an obvious purpose. The combination provides means for gaging the drill and at the same time indicating the hole where it



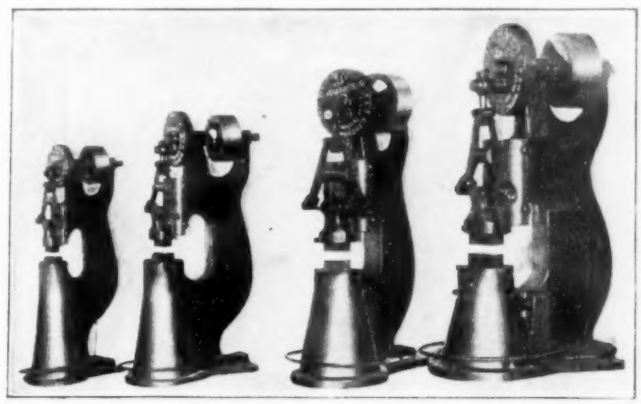
GAGE AND DRILL HOLDER

belongs when not in use. As can be noted from the illustration, guide lines run from the V-slot to the holes, and when placing a drill in the holder it is simply a matter of gaging the drill and then following the corresponding line to the correct hole. When selecting a drill for use the gage will often be found useful in addition to the fact that every hole has the size number stamped beside it. Another feature of the gage, is that on the opposite side of the slot from the guide lines it is graduated in thousandths and can be accordingly used independently to determine exact sizes.

Mayer Power Hammers

The Kaukauna Machine Works, Kaukauna, Wis., has redesigned its line of Mayer power hammers. The hammers are built with heavy gray cast-iron frames, made in one part for the smaller hammers and in two parts for the two larger sizes. The rams are steel castings and operate in V-guides. The guides are cast integral with the frames with a cored opening between them which makes it possible to spring them apart before machining, thus providing for the take-up for wear and doing away with all gibs. A separate adjustment at the tops and bottoms of the guides makes possible adjustment for excessive wear at the lower ends of the guides where the wear is naturally heavier. The ram connections are designed to provide a cushion at the upper extremity of the stroke which in turn adds to the impetus of the next downward stroke and blow. An alloy steel is used for the toggle-bolts. Provision is made for adjusting the spring tension. The removable bearing bushings used are medium-hard gray-iron castings. The dies are made from crucible steel and are regularly furnished with either standard flat forging faces or with rounded faces for plow work.

The hammers are built in five sizes having a respective capacity of 25, 50, 100, 250 and 500 lb. They will forge round stock from 2 in. to 8 in. and square



MAYER POWER HAMMERS

stock from 1½ in. to 7 in. Flat stock from 2½ in. to 8 in. wide can be handled edgewise. Power required, 1 to 7½ hp. Weight without motor, 750, 1,500, 3,000, 5,800 and 10,000 pounds.

"Cruban" Micro-Automatic Taper Turning Tool

The Fairbanks Co. is the distributing agency for a turning tool that is manufactured by the Cruban Machine and Steel Corporation, 63 Duane St., New York.

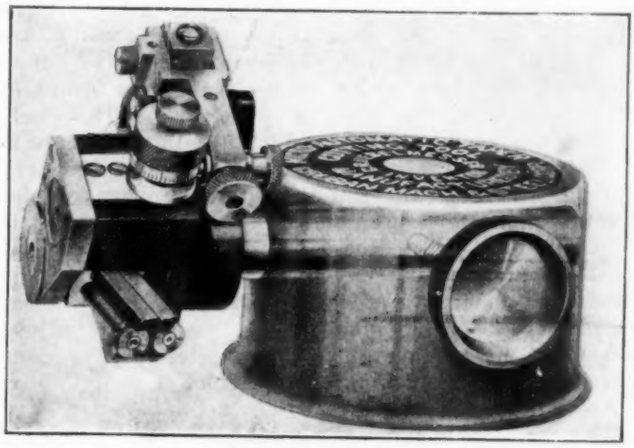


FIG. 1. SIDE VIEW OF MICRO TAPER TURNING TOOL

The tool is designed for use with a hand screw machine, automatic screw machine, or lathe, and is fitted with a straight shank or taper shank as required. It will automatically cut any taper from $\frac{1}{16}$ in. per foot to $\frac{3}{4}$ in. per foot and any length up to 6 in. and it can be furnished to meet greater capacities if desired. The tool is entirely self-contained and is not affected by lost motion in the turret or tailstock.

Two views are shown, Fig. 1 being a side view and Fig. 2 a front view. The cutting of a taper is governed by the feed pressure moving a plunger which guides and regulates the cutting tools. As the feed advances the plunger movement revolves a lead screw, and as a result the cutting tools are backed away evenly and automatically, producing more or less of a taper according to the pitch of the screw. This operation may be clearly followed by reference to Fig. 2. The revolving cylinder *A* is connected to the plunger *B* by a steel

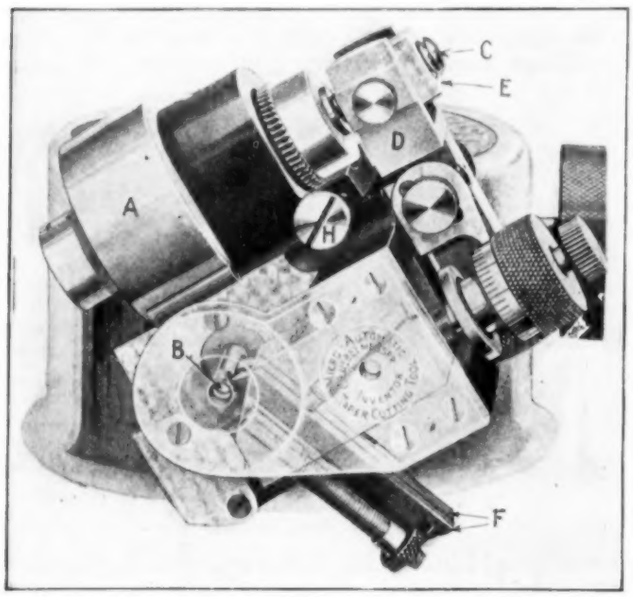


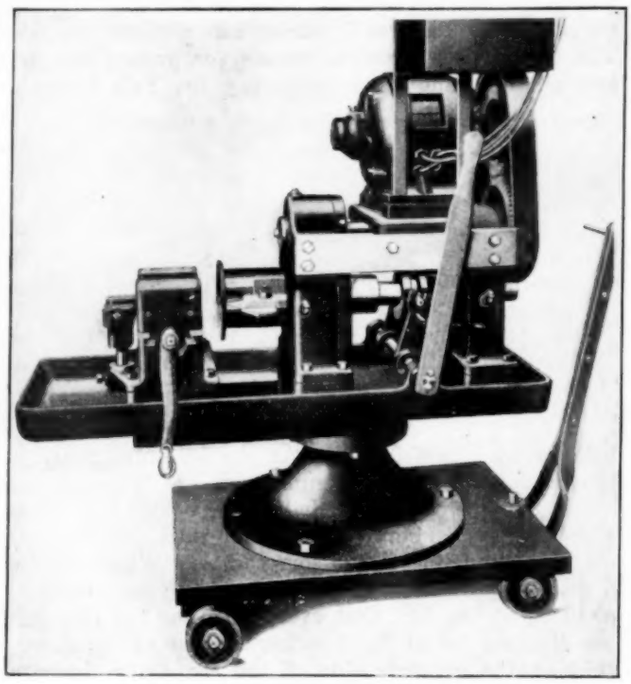
FIG. 2. FRONT VIEW OF MICRO TAPER TURNING TOOL

belt and as the plunger is pushed back by the work, the belt attached to the inside revolves the cylinder *A* in a similar manner to that of a rack-and-pinion movement. A clock spring inclosed in the cylinder *A* keeps a constant tension on the plunger through its entire stroke. The lead screw *C* revolves with the cylinder *A* and the pivoted lever *D* moves accordingly, owing to the threaded block *E* that connects the two. At the opposite end of the lever *D* the cutting tools *F* are connected and move with the lever. When the cut is finished, the clock spring causes the return stroke of the plunger as the work is withdrawn. The clock-spring tension may be changed by the adjusting screw *H* which engages the small worm gear. A felt washer is provided to keep chips and dirt out of the space occupied by the plunger. Different lead screws are required to cut different tapers, these being readily removable.

The roughing and finishing cutters *F* are of high-speed steel and are adjusted initially by knurled-head screws that engage non-slip notches. Final adjustment is made through a micrometer arrangement, graduated to 0.0005 in., and the tool is said to turn out work in thousand lots within a limit of 0.0005 in. With each tool is supplied a chart giving all lengths and diameters of taper that may be turned with the tool.

"Namco" Bar-Pointing Machine

The National Acme Co., Cleveland, Ohio, has added to its "Namco" line a portable motor-driven bar-pointing machine, as shown in the illustration. The machine is used to point the ends of bar stock preparatory for screw-machine operations. Being portable, it can be easily removed from place to place where the stock is stored, thus avoiding unnecessary handling of material. When pointing round stock, the bar is held in the machine vise while the revolving cutter head is brought into position and fed by the hand lever that engages the slidable spindle. Square or hexagonal bars are not held in the vise, but simply pushed against the revolving cutter head, the vise loosely engaging the bar to prevent it from twisting during the cutting action. The vise jaws are adjustable to all standard shapes and sizes of bars. The spindle is gear driven



"NAMCO" BAR-POINTING MACHINE

and the revolving cutter head carries a plain cutter that is easily removable for sharpening. A flanged base is provided to prevent the chips from dropping on the floor.

When preparing large amounts of stock, two machines operating end to end may be used to advantage; in such a case it would be unnecessary to reverse the bar. The machine is driven by a 1-hp. motor that is complete with switch and all necessary connections. The dimensions of the machine are: length, 4 ft; width, 2 ft.; height, 4 ft., including motor.

Multi-Graduated Precision Grinding Attachment

The Precision and Thread Grinder Manufacturing Co., 1932 Arch St., Philadelphia, Pa., is demonstrating improved grinding equipment. This comprises several attachments capable of use on a variety of work, though particularly intended for thread grinding.

Threads may be ground with a single attachment as shown in Fig. 1 or two such attachments may be used,

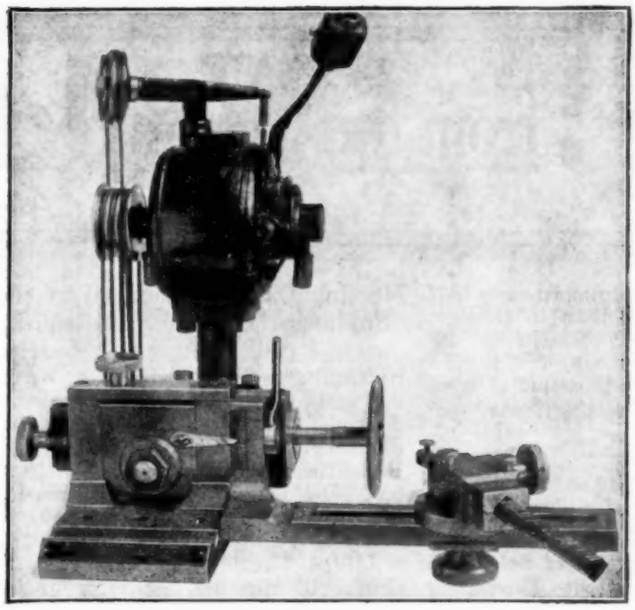


FIG. 1. MULTI-GRADUATED GRINDING ATTACHMENT

one on each side of the work. In the latter case the wheels are beveled so that they grind on opposite sides of the thread angle as shown in Fig. 2. On production work where a large number of duplicate pieces are to be ground, the wheels are set to the thread of the first part. The threads on the following pieces are set to the wheels, provision being made for this by an adjustable dog. After the wheels are once set redressing them does not change their alignment in relation to the thread.

A graduated scale is provided for setting the wheel center to the same height as the work center. The multiple endless belt is kept in constant tension by a spring tightener on top of the motor.

The wheel-truing device has the base graduated for angular setting and is also provided with setting pins for accurate location of the device 30 deg. each side of the center. Ball bearings are used throughout and are protected from abrasive dust by felt-lined steel washers. Adjustment is provided for taking up all end motion. The regular equipment includes the truing device.

It is claimed that using two of these machines on thread grinding will result in increased production. In addition to thread grinding a variety of plain grinding, both internal and external, may be done on this machine.

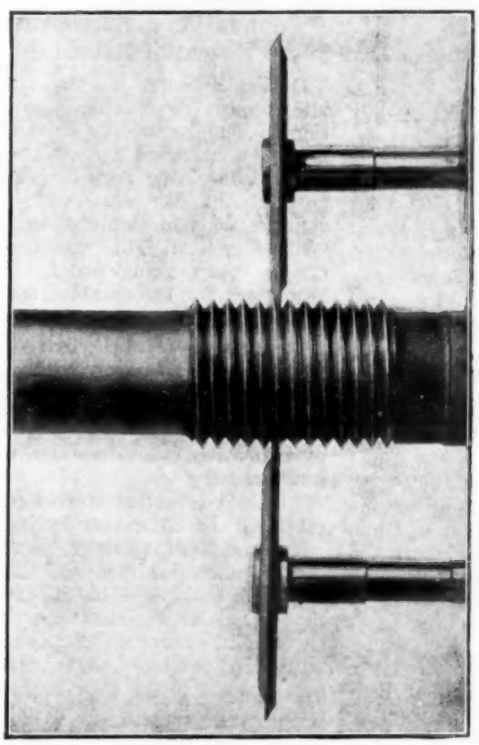
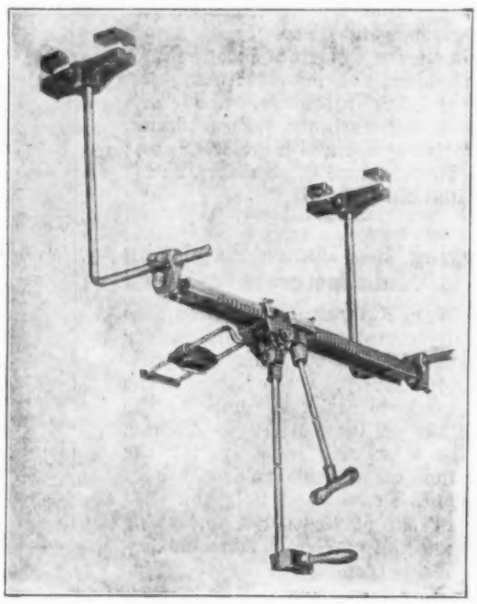


FIG. 2. ARRANGEMENT OF WHEELS FOR DUPLEX GRINDING

Kremer-Cummins Mechanical Shifter

A belt-shifting device designed for use in connection with cone pulleys and operated by means of two handles, is being manufactured by the Kremer-Cummins Machine Co., 133 East 55th St., Cleveland, Ohio. The



KREMER-CUMMINS MECHANICAL SHIFTER

device proper is attached overhead near the cone pulley but is supported by independent brackets that are adjustable to suit conditions. A single piece of channel iron of suitable length is used to support a sliding carriage that is moved by means of a rack-and-pinion arrangement. The rack is formed by cutting teeth in one leg of the channel, the pinion being attached to the end of a ½-in. shifting rod that can be turned by means of a handle at the lower end. Attached to the carriage is a loop that surrounds the belt. Hence, as the carriage is moved along the channel, the belt is carried with it. To prevent overtravel of the carriage a stop is made at each end of the rack by bending a tooth at right angles for the carriage to strike against. A separate shifting rod, made of ¾-in. pipe, is used for the belt at the lower pulley. The top end of the pipe is pivoted to the carriage, while its lower end is held in position by means of a casting that forms a loop around the belt and also serves as an operating handle. No part of the shifting arrangement is attached directly to the machine or countershaft.

Sparks from the World's

By E. C. Porter,

Ready Market in Palestine for Machinery

American mechanical devices of all kinds will find a ready market in Palestine, according to a request received by the Foreign Trade Bureau from a dealer in Jaffa.

He says agricultural machinery of all kinds, especially tractors, are in great demand, and that there is a good market for automobiles. Other articles for which there is a good market include gasoline motors from one to fifty horsepower, Diesel type motors 200 horsepower, marine gasoline motors, machines for manufacturing ice, cement mixing machines, wood and stone working machines, lathes, planes, vises, motor-cycles and bicycles, presses for the manufacture of oil and stills for oil distillation.

Arranging to Finance Exporting Manufacturers

The War Finance Corporation has practically completed arrangements for two loans of $5,000,000 each to exporting manufacturers. One of these loans will be made to assist in financing the exportation of locomotives to Poland, while the other will be made for the exportation of agricultural machinery to England, France and Belgium.

A third loan of $5,000,000 concerning the exportation of electrical machinery is now being considered by the War Finance Corporation, and it is expected that the negotiations will be consummated in the near future.

An advance is also being made by the War Finance Corporation to the extent of $2,000,000 which will furnish funds for the financing of the exportation of machinery for the reconstruction of steel mills in northern France.

Shipyards Have 805,000 Gross Tons Under Construction

American shipyards, instead of falling back as Government contracts are suspended, cancelled or completed, are forging steadily ahead, according to a statement just issued by the Atlantic Coast Shipbuilders' Association.

Work for private accounts is replacing that which was being done for the Shipping Board and although a number of orders for American industries have been completed or withdrawn during the past few weeks, the shipyards today are building over a quarter of a million gross tons more than they were a month ago and nearly half a million tons more than in October. The total now under construction, exclusive of all Government work, is 805,000 gross tons, the equivalent of more than 1,200,000 deadweight tons of seagoing vessels.

Major Johnson Now Assistant Director of Sales

Major H. S. Johnson, former special assistant to the Director of Sales, has been appointed Assistant Director of Sales to fill the vacancy caused by A. L. Mercer, who resigned to become president of the Needham Tire Co., Needham, Mass.

MAJOR H. S. JOHNSON

Major Johnson assumes his new duties fully conversant with the work of the Office of the Director of Sales, having been in close touch with the various salvage and sales boards in his capacity as special assistant to the Director of Sales.

He graduated from Lehigh University in 1897, shortly after which he became associated with the Niagara Falls Power Co. where he remained until 1901. From 1901 to 1903, Mr. Johnson was general manager of the People's Railway Co., of Dayton, Ohio. He later became connected with the Westinghouse, Church & Kerr Co. and served as assistant to George Gibbs in large construction and tunnelling projects in New York City.

In 1907, Mr. Johnson organized the Johnson, Wahley Electric Co., of Buffalo. At the outbreak of the war, he was commissioned and detailed to design electrical equipment for overseas ordnance storage depots. He developed a guard system for storage depots.

Meeting Dates Announced by the Engineers' Club of Philadelphia

George Otis Smith, director of the United States Geological Survey, Washington, D. C., will lecture at the regular meeting of the Engineers' Club of Philadelphia to be held at Witherspoon Hall, Tuesday, Jan. 20, 1920, at 8.15 p.m. His subject will be "Engineering as Prosperity Insurance," and will be illustrated with lantern slides.

At the Tuesday luncheon, Jan. 20, Grover G. Huebner, professor of the Wharton School of Finance and Commerce, University of Pennsylvania, will make an address, the subject of which will be "Pending Railroad Legislation."

On Jan. 27 at the Tuesday luncheon Colonel Marston T. Bogart, professor of the Department of Chemistry, Columbia University, will make an address on "Chemical Warfare."

The Philadelphia Section and the New York Section of the Society of Automotive Engineers will hold a joint meeting in Philadelphia on Jan. 22, and in the afternoon a special trip will be made to the Philadelphia Navy Yard to inspect the Diesel engine taken from a German submarine.

Foundation for Invention and Research Established

On Jan. 9 about one thousand people interested in the establishment of a National Foundation for Invention and Research, attended a convention at the Hotel Astor, New York City. The purpose of the convention was to make definite plans to mobilize American inventive genius. This mobilization has quietly been going on for the past two years for the establishment of the foundation under the direction of Thomas Howard, chairman of the National Institute of Inventors. The foundation has now nearly three thousand members scattered throughout the country. The project is supported by many representative men of science and industry.

At the convention it was planned to establish the laboratory by independent endowments of wealthy men and the larger industrial firms of the country and then make it self-supporting by a percentage arrangement on the inventions of inventors which the laboratory will help develop and market, giving financial aid to the poor inventor. The election and installation of officers was held in the afternoon, followed by a banquet in the evening, at which a number of representative men spoke in behalf of the movement.

Industrial Forge

News Editor

A New Building for the Vonnegut Machinery Company

The Vonnegut Machinery Co., Indianapolis, Ind., has let contracts and work has been started on a building, 100 x 300 ft., with two stories and basement. It will be of reinforced concrete and metal-sash, factory-type construction. The location is 19-20 West South St., opposite the Union Station. The first floor and basement will be used for the business of the Vonnegut Machinery Co., including office, display floor, and storage for the machine tool and machinery accessories department, as well as machine shop and storage facilities for the used-machinery department.

The Kerbaugh Construction Company Purchased by the Poland Construction Company

The Poland Construction Co., Philadelphia, has purchased the Kerbaugh Construction Co's, plant, between Bellwood and East Altoona, Blair County, Pa. The new firm has taken over the plant to manufacture boilers of all kinds and construction work implements and machinery. Three hundred men will be employed. The grounds cover 154½ acres. The shop is 119 x 224 ft. and the foundry 48 x 48 ft., both buildings being of structural steel. The storehouse is 60 x 208 ft. with a 9,000-ft. railroad siding and a private reservoir with a capacity of 4,000,000 gal. There are six other frame dwellings and farm buildings. The property was leased recently to the Empire Engineering Co., New York.

Working Out a Plan for Distributing Surplus Machinery to Schools

With the receipt of fifty answers to questionnaires regarding surplus machine tools available for educational institutions under the Caldwell Act, the machine-tool section of the Office of the Director of Sales of the War Department is now working on a plan of equitable distribution of the surplus machinery among schools filing applications.

Of the answers already received, a majority of the institutions show a preference for lathes, while drilling and milling machines are second in demand. Many of the schools answering have also expressed a desire for grinding machines.

While the basis of allotment will not be finally decided upon until at least 100 answers have been received, the members of the machine-tool section are considering distribution of the equipment on the basis of enrollment and floor space.

Approximately 1,000 questionnaires were sent out to as many schools, which are entitled to machine tools under the Caldwell Act. The answers that have been received have come from schools in all parts of the country, ranging in size from small academies to large universities.

Atlantic City Selected for U. S. Chamber of Commerce Convention

The United States Chamber of Commerce recently announced the selection of Atlantic City for its 1920 convention, which will open April 26. It will be the first gathering of the organization ever held in Atlantic City.

A preliminary program contemplates the presence of two or more members of President Wilson's cabinet and fully 5,000 representatives of local trade bodies from all parts of the nation.

Nuttall Products To Be Handled by Westinghouse Salesmen

A change in the merchandising policy of the R. D. Nuttall Co., Pittsburgh, Pa., has just been announced, effective Jan. 1, 1920. Under the new arrangement the Westinghouse Electric and Manufacturing Co. salesmen throughout the United States will handle the railway and mine products of the R. D. Nuttall Company.

All Nuttall industrial lines and other products, however, will be taken care of through the main Nuttall office at Pittsburgh, Pa.

Training Course for Foremen

The Bridgeport Brass Co., of Bridgeport, Conn., has inaugurated a plan of training for its foremen and other members of the supervisory force.

A class of seventy-three men has been formed to pursue a course in modern production methods which comprises the study of specially prepared text material, the solution of practical factory problems, and the discussion of this material at six biweekly meetings held in the plant after hours. These meetings will provide an opportunity to bring home the application of the work to the special production problems of the company. At each meeting a lecture will be delivered by an experienced production man and the lecture will be followed by a discussion.

Business Conditions in England

BY OUR ENGLISH CORRESPONDENT

London, Dec. 12, 1919.

At the moment any attempt to bring the molders' strike to an end has proved fruitless; and, while some of the working people seem inclined to return to work quickly, the majority seem rather intent on securing full satisfaction of their demands and even talk of increasing them. Meanwhile, the engineering industry does the best it can and is in the extraordinary position of having large orders at quite unusual prices, but without the means to carry out these orders. Calling on some eight varied shops in the Halifax district, a correspondent reports that half a dozen of them were closed down, solely for want of castings.

Apart from ordinary labor trouble, another handicap which is general among engineers, and presumably among manufacturing firms as a whole, is the inadequate service now provided by the railways for the transport of goods. Railway working has nothing like recovered from war effects and the two leading causes for a condition that almost amounts to chaos in some instances, appear to be the working of the eight-hour day, plus the shortage of wagons.

Throughout trade and industry the consumer is now receiving scant attention. When an employer concedes to demands for increased wages, he simultaneously advances his prices. This has been shown of late particularly in the building trades and in certain sections of the clothing trades.

The proposal to adopt the 24-hour method of stating time is receiving consideration by a departmental committee of the British home office. It is of course the European continental system, and the recent war made many men well acquainted with it. One advantage is that it prevents mistakes which may arise owing to the a.m. and p.m. notation being the same. At a preliminary meeting, the Federation of British Industries agreed to support the movement.

As was stated in our last letter, the British Engineering Standards Association has been considering the whole subject of limit working in engineering. Accepting the hole as a basis, the committee concerned has been unable to recommend either the uni-lateral or the bi-lateral system of tolerances; that is, either a + tolerance alone or a + and — tolerance. They have, in fact, been circularizing the engineering industry of Great Britain, but received only

about 200 replies which were almost equally divided. Each side can claim firms of importance. It is specially stated that "as showing some of the practical difficulties of the situation, some of the important firms of the country, while agreeing that theoretically the minimum-hole basis may be ideally the best, are prevented from supporting it owing to commercial considerations."

The committee was, in fact, unanimous in feeling that no decision could be made in the light of present conditions. The number of firms in Great Britain actually working on a strictly limit system is not, it would seem, readily ascertainable. A contributor to the European edition of this journal has put the number at about 100, and informal enquiries made editorially tend to suggest that this estimate is not wild. It is suggested, for example, that in the west of Scotland district there are some twenty or thirty firms, while in the Halifax district the number might be a dozen. Altogether, the figures cannot be regarded as high. Yet one firm, who should certainly be in a position to get closely to the true figures, while admitting the difficulty of estimating, put the number at more than 2,000.

Demonstrations of the Constantinesco system of wave transmission of energy are promised for the new year. Put in its simplest form, in this system will be two cylinders each with plunger, the two cylinders being connected by pipe, of any length according to the extent of transmission desired and completely filled with water, or other liquid, all air being excluded. On either plunger being set into reciprocation the other would move in synchronism, not by the actual passage through the pipe of water itself, but by waves of the compressed fluid, the speed being that of sound. Plants can be built up of single-phase, two-phase or three-phase character, and either reciprocating or circular motion could be set up at the far end. At present, very little of numerical character is available, but as a guide it is stated that, using water, ordinary steam quality piping 1 in. in diameter will transmit 10 hp. for moderate distances with good efficiency. In the case of a riveting or calking hammer or the rock drill, the motor forms part of the machine. It is clear that for reciprocating motion the system may easily have advantages over electrical rock drills, etc., electric means being more suitable for the production of rotation rather than reciprocation. A motor car is promised "to prove the practical application of wave transmission to a moving vehicle. The gear box to be entirely eliminated" and "the same equipment will be available for the internal heating of the vehicle." Devised by George Constantinesco, a Roumanian, the system is being worked commercially by Dorman & Co., Ltd., Stafford. Its use during the war for interrupter gear, enabling the airman to fire through the blades of the airplane propeller, has been made public some time since.

The Ministry of Labor has of course a training scheme applicable to ex-service men, grants being made so that the demobilized soldier may be trained for professional, business or technical positions, provided family funds are not available. In the engineering industry the trade unions have objected on three main grounds; namely, that the ordinary industrial apprentice will be "done out of" the better jobs, that many apprentices are still in the army and many trade unionists unemployed, and that the scheme would militarize works. The ministry concerned has modified its scheme with a view to meeting these objections. Candidates are selected by interviewing boards in various centers of Great Britain and, in official language, "in order to ensure that no trade union principles are infringed it is proposed that the engineering trade unions should nominate representatives to sit on these boards."

Excepting the disabled, the candidates for engineering must be men who have not previously entered in any other trade or profession and the number of such men allotted to engineering is no more than 1,750, a mere fraction of 1 per cent of the total membership of the engineering unions. It is further provided that the number of these men under training in any given factory shall not exceed 1 per cent of the total number of employees in the works. The training is intended to qualify the men for the commercial or office rather than the workshop side of engineering. The Ministry of Labor in making a statement has mentioned that more than 50 per cent of the ex-service men who have thus obtained grants were from the ranks, while of officers thus helped to take a place in civil life, many are men who have risen from the ranks.

American Constitutional League Formed by Milwaukee Business Men

Prompted by the need of and demand for a better understanding on the part of the public generally, of the fundamental soundness of the American Constitutional Government and the fallacious and, in some cases, vicious attacks upon it, several influential business men of Milwaukee have formed the American Constitutional League. The league is non-sectarian and non-racial in membership and purpose. Its activities will be confined solely to Americanization work, which will embrace all forms of education and publicity in favor of Americanism and in opposition to all radical doctrines which have for their purpose the overthrow of our existing form of representative government and our present social and industrial order. Frank R. Bacon, president of the Cutler-Hammer Manufacturing Co., of Milwaukee, Wis., has been elected chairman of this new organization.

Company Formed to Erect Workingmen's Homes in Hartford

The various manufacturers of Hartford, Conn., are planning the formation of a housing company for the purpose of erecting several workmen's houses during the coming year. It is the plan of the members of the new project to have a company with a capital of at least one milion dollars, and to erect about 1,400 or 1,500 homes during the year 1920. Charles B. Cook, who is vice president of the Royal Typewriter Co., is the chairman of the committee of organization.

The End of the German Steel Works Association

BY OUR GERMAN CORRESPONDENT

There exists scarcely a doubt at the present moment that the days of the German Steel Works Association are numbered, and that the state of affairs today is only the presage of a permanent dissolution. Not merely the Rhenish steel works and the German-Luxemburg Mining and Foundries Co., which have taken little notice of its statutes for some time past (for reasons both tactical and economic) and so hastened its decay, but most other works, too, have come to the conclusion that the association in its present form is a thing of the past. This point of view is mainly resultant from the end of the war with its absolutely altered conditions, and the demands made upon the German iron and steel industry by the terms of the peace treaty. The association was dependent upon the production of Thomas steel, which has increased enormously since the construction of large foundries in Luxemburg and what was formerly German Lorraine. These last mentioned have been confiscated entirely by the peace treaty, and the important Luxemburg works have passed into other hands since their liquidation, with little chance of German participation in anything concerning their administration in the future. The Saar works are still members of the association, but for how long a duration it is impossible to say. Upon their secession—and in reality they have barely counted as a delivering factor for the association for a long time past—the importance of the association will even further be lessened.

The far-reaching influence of these groups may be gathered from the fact that they were represented by a participation of three million tons in the approximate six million tons output before the present economic upheaval. The works concerned are the following: Burbach-Eich-Duedelingen, the Gelsenkirchen Mining Co., de Wendel in Hayingen, the Romach Foundries, the German-Luxemburg Mining and Foundries Co. (Differdingen and Ruemelingen sections), the Lorraine Foundries and Mining Union, Thyssen's Steel Works

(*Continued on Page* 164*b*)

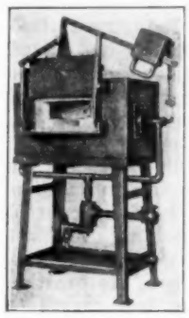
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Furnace, Oven Type

Surface Combustion Co., 366 Girard Ave., New York, N. Y.

"American Machinist," Oct. 16, 1919

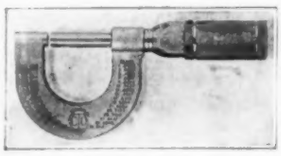


Size A-25; the door-lifting mechanism does not require the use of chains or pulleys, but is a simple, compact link motion having a dead-center feature that tends to keep the door in either open or closed position without depending upon friction. Specifications: Inside heating space, 12 x 10 in.; size of entrance, 6½ x 10 in.; height floor to hearth, 42 in.; air pipe, 2 in.; gas pipe, 1¼ in.; floor space, 27 x 48 in.; net weight, 1700 lb.

Micrometer, Direct Reading

Production Equipment Co., Inc., 1 Madison Ave., New York, N. Y.

"American Machinist," Oct. 16, 1919



The micrometer being marketed by the Production Equipment Co., Inc., 1 Madison Ave., New York City, is said to be very easy to read as the barrel has but 10 graduations instead of 40 and the dial windows show at a glance the measurement registered. The micrometer is of standard size and weight comparatively, and is made in sizes up to 12 in.; with or without ratchet stops and ten-thousandth graduations.

Tester, Hardness

W. & T. Avery Ltd., Birmingham, Eng.

"American Machinist," (English Edition), Oct. 11, 1919

For quick action the vertical straining screw is disengaged in its keyway by a thumb screw at the top of the frame. Also the handwheel for rotating the straining screw can be raised or lowered in order to give a full view of the specimen under test. Weights equivalent to 500 kg. and 3000 kg. load are provided. As the load is applied through a worm drive it cannot be applied suddenly, so that the machine experiences no shock; moreover, the rate of loading during the test is practically uniform, as compared with jerks which may result from the load being added by pumping.

Shaping Machine, Double-Headed

Fairbairns, Leeds, England.

"American Machinist" (English Edition), Oct. 18, 1919

Length of bed, 12 ft. 6 in.; traverse of each head, 3 ft.; work tables, 30 x 20 in. Each headstock is independently driven by 10-hp. constant-speed motor, through double helical gears, and 4-speed gear box, mounted on a foundation casting bolted to the end of the bed as shown. The gear box gives 39.25, 23.75, 16.6, and 9.7 strokes per minute. The overall floor space occupied by the machine is 24 x 8 ft., and its net weight is 11½ tons.

Boring Mill, Vertical

G. Richards & Co., Ltd., Manchester, England.

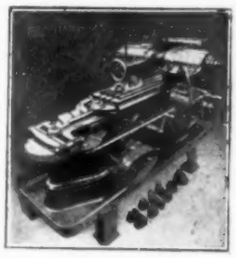
"American Machinist" (English Edition), Nov. 1, 1919

Net weight, 80 tons; capacity is 10 ft. in diameter, and to admit 10 ft. high under the toolholders and 10 ft. 9 in. under the cross-slide. The machine is fitted with two ordinary swivel tool bars on the cross-slide having 66 in. down feed, and with side head fixed to the right-hand housing and to the base. The table is 10 ft. in diameter and is driven by spur-gear ring, 1½ diametral pitch, 9 in. face, from a six-speed gear box driven by a 50-hp. variable-speed motor. All the tool bars have vertical, horizontal and angular self-acting feeds, with rapid power traverses to these motions.

Keyseating and Mortising Machine

Smith and Coventry Ltd., Manchester, England.

"American Machinist" (English Edition), Sept. 20, 1919



Long pieces to be machined are held in a two-jaw universal chuck and supported at end by tailstock clamp. Cutters up to 1¼ in. in diameter are held in spring collets and are driven by bevel gears. Maximum distance between spindles, 15 in.; minimum distance, 4 in. Table has T-slots and 12-in. stroke. Depth of cutter feed, each stroke, 0.004 in. to 0.016 in. Speed of traverse, 36 in. per minute.

Milling Machine, Type-M, Plain, Universal, Vertical

Cincinnati Milling Machine Co., Cincinnati, Ohio.

"American Machinist," Oct. 23, 1919

No. 1 Plain, range, 22 x 8 x 19 in.; net weight, 2200 lb.
No. 1 Universal, range, 22 x 8 x 18 in.; net weight, 2500 lb.
No. 1 Vertical, range, 22 x 12 x 16 in.; net weight, 2300 lb.
No. 2 Plain, range, 28 x 10 x 19 in.; net weight, 2500 lb.
No. 2 Universal, range, 28 x 10 x 18 in.; net weight, 2800 lb.
No. 2 Vertical, range, 28 x 12 x 16 in.; net weight, 2600 lb.

Dimensions common to all No. 1 Machines; tables, 37 x 10½ in.; taper holes, 14 B. & S.; hp., 3; pulley, 12 in.; belt, 1½ in.

No. 2 Machines: Tables, 49 x 10½ in.; taper holes, 14 B. & S.; hp., 5; pulley, 12 in.; belt, 2 in.

Lathe, Large Engine, Movable Bed

G. A. Harvey, Ltd., Govan, England.

"American Machinist" (English Edition), Nov. 8, 1919

Swing, 12 ft.; with bed in center, 6 ft.; over saddle, 4 ft. 10 in.; between centers, 25 ft.; movable bed, 30 ft. x 5 ft. 3 in. x 3 ft. deep; 50-hp. constant speed motor; has oil system and ball thrust spindle; feeds, 3 to 32 cuts per inch; threads 1 in. P. to 16 per inch; floor space, 42 ft. to 6 in. x 22 ft., approximate weight, 86 tons.

Clip, paste on 3 x 5-in. cards and file as desired

(Hagendingen section), Stumm Bros., the Roechling Iron and Steel Works and the Dillinger Foundries.

The future relationship of the Upper Silesian works to the association is still undecided. It is only represented by an entire participation of 324,000 tons, but as remaining in the association, should the latter continue to exist at all, would still be of value. The Rhenish-Westphalian works which at the present moment is the very back-bone of it, together with the Bavarian Maximilian Mine, the Georgmarien Mining and Foundries Union (at Osnabrück), the Pain Rolling Mills, and the Cast Steel Factory at Doehlen in Saxony, form a co-operation of about three million tons. The greater percentage of these works refuses to entertain any further the idea of a steel works' association which would represent a pure agreement of sales with stipulations as to co-operation. The works have widely organized trading associations at its disposal for exploiting "A" as well as "B" products. Through this it has lost still more in prestige, especially as it has proved itself incapable of adaption to the constantly changing circumstances affecting production during the past few years. It was in danger of dissolution more than once during the war, and this was only prevented by official intervention in the interests of a uniform regulation of army supplies. Later on, the Federal Board of Economics (Reichswirtschaftsamt) intervened, but this endeavor to prolong the life of the association by force only partly succeeded.

A number of works went their own way, despite orders to the contrary, looking upon the association as nonexistent. On the whole, the conclusion was formed in interested circles that nothing is to be gained by using economic pressure at the present moment, and that the entire organization of the association served rather to hinder than to develop the full productive possibilities of the steel works.

The demand for the absolute release from the administration of iron, has been met with a flat refusal on the part of the government till now, and it is possible to gather from this standpoint that they might not be unwilling to aid the formation of a new steel works association in some form or other. This demand, if made from the point of view of retaining official price control over the formation of prices, might be fulfilled under the conditions of the already existing German Steel Union, the so-called "Mantelsyndicate." Another blow to the association was the fact of its being refused the representation of the German steel industry at international conventions. Whether these conventions will meet again before long is a matter of doubt; in any case the part that Germany might be called upon to play in them would be small enough. If one looks back to the time when the association was founded, in 1904, it is only possible to class the net results accomplished as a failure. The big plans for organizing the German iron industries to which it was to act as a prelude failed utterly; a fact which is less due to its own fault than to the constantly changing circumstances which production had to fight against. The process of concentration in the iron industry shifted the basis of production in the mixed works constantly to its own advantage as regards the further manufacture of the raw products for which sales the association was responsible; this co-operative movement did not encourage the foundation of sub-associations whose functions could be fully carried out by the existing trading organizations. As a consequence, the association lost more and more of its prestige after the "B" products had ceased to be part of it. The attempt to organize the association on a broad commercial basis failed owing to strong opposition in various forms.

Trade Currents From Cleveland, Chicago and Philadelphia

Cleveland Letter

The first week of the new year finds the machinery market of Cleveland and northern Ohio district facing a much more prosperous season than was anticipated toward the end of 1919. With the usual retention in all industry due to the inventory-taking activities, there were fewer orders and less inquiry than was anticipated when early fall buying was at its height. There was entirely too much shopping around to please machinery manufacturers and distributors, as this shopping was not backed up any too definitely with prospects for real orders.

The significant feature, in the minds of leaders in the trade here, is that these earlier inquiries now are bearing fruit in the form of orders for new equipment. That the early part of the new year will be even more active than anticipated is being shown by the variety of equipment required. Up to the last month or so the bulk of business has been coming from the automobile industry, or interests related to it. Now, the business is coming forward from general manufacturing. Any tendency toward curtailment of production or lessening of business generally, as has been indicated off and on by authorities supposedly fairly certain of their predictions, has not only failed to develop, but has not even given a hint that it will for an indefinite period.

One factor that probably is stimulating interest among purchasers, and which is aiding considerably, it is believed, toward the enlargement of purchases when it was first thought only a few fill-in machines would be taken, is the announcement of a new price list by the majority of producers. It can be stated here quite definitely that the machinery industry has been unique in the matter of not advancing prices to the apparent limits that other industries have advanced prices for their products. In effect, the first of the year is an average increase of 10 per cent on machinery and equipment, and though a modest increase, it is sufficient to arouse the buying interest.

Several firms report they are booked ahead, some to March, for equipment for general manufacturing and toolroom requirements. The labor problem, in evidence in this industry as in others, has improved with the turn of the year, but not to the extent that shipments are all up to prompt delivery, and it is not unlikely that this condition will continue for some time to come.

A notable event of interest to machinist interests is the celebration this week of the Lamson & Sessions Co., manufacturer of machinists' small supplies, which marked fifty years in business in Cleveland. A feature of the celebration was a banquet at Hotel Cleveland at which three employees, with the firm since its beginning, were present. They are R. J. Gardner, superintendent, and Herman Brown and Louis Brown, foremen. Each received a gold watch and chain as a mark of appreciation for their long service. Sixty employees have been with the firm twenty-five years, and more than 100 for fifteen years.

The company began business at Mount Carmel, Conn., in 1865. The business was moved to Cleveland in 1869. The organizers were I. P. Lamson, S. W. Sessions and Thomas H. Lamson. It became a corporation in 1885. The control of the company has remained within the family through its entire existence.

Chicago Letter

Reversing the usual order of things, business during the week over New Year's Day kept up at an excellent pace. It is true that there were fewer inquiries than in previous weeks and less shopping around by individual buyers to see what they could find in dealers' stocks, but actual sales and shipments show no decrease. A summary of the year's business among all dealers leads to the assumption that in 1919 Chicago did about 80 per cent as much machinery business as in 1918, and a little more than in 1917. Considering the dullness of January and February, and the steel and coal strikes, this is really surprising.

The new year opens with the railroads doing some buying and much inquiring and the great corporations showing signs of interest. The Burlington has just completed extensive purchases and the C. I. & W. R.R. is making inquiries. J. B. Clow & Co. has purchased equipment for its Ohio plant.

Orders for future shipments are heavy on all dealers' books. This condition is accentuated by slow deliveries of goods from the factory. Turret lathes seem to be hardest to get, from three to nine months being required for delivery on current orders, depending on size and make. Engine lathes

(*Continued on page* 164*d*)

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Shaping Machine, Crank, Heavy-Duty

Perkin & Co., Ltd., Leeds, England.

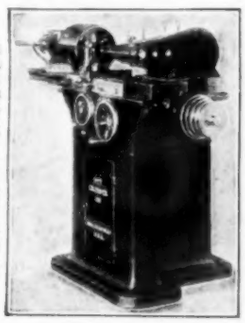
"American Machinist" (Eng. Edition, Nov. 8, 1919)

Has variable feed, while running, by adjustable eccentric bull wheel; work table, 16¾ x 12 in., feed both ways. All gear drive gives eight speeds from 10 to 100 ft. per minute. Speed reduction by 4-speed gear box inclosed. Back gears in machine body, operated by steel clutches. Dimensions, over all, 56 x 42 x 54 in.; net weight, 2000 lb.

Grinding Machine, Internal

Ott Grinder Co., Indianapolis, Ind.

"American Machinist," Oct. 23, 1919

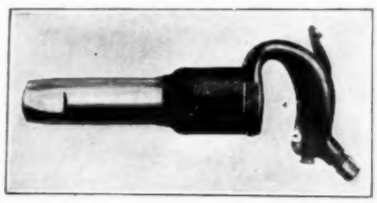


Swing, without guard, 12 in., with guard, 10 in.; will grind hole 6 in. in diameter; table travel, 24 in.; will grind tapers 120 deg. included angle; automatic crossfeed, 0.00025 in. to 0.003 in.; diameter of work-spindle bearings, 2 in.; hole through work spindle, 1½ in.; speed of countershaft, 600 r.p.m.; main pulley, 15 in.; work speeds, 85 to 425 r.p.m.; spindle speeds, 8000 to 20,000 r.p.m.; table speeds, 16 in. to 50 in. per minute; floor space, 38 x 70 in.; weight, 1950 lb. The equipment comprises a 12-in. faceplate, combination straight and radial wheel-truing device, 9-in. collet chuck, pump and complete overhead works.

Hammer, Master Sure-Lox Chipping

Keller Pneumatic Tool Co., Chicago, Ill.

"American Machinist," Oct. 23, 1919

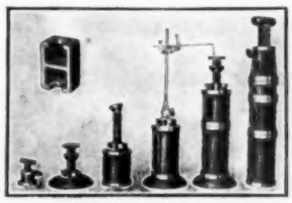


Handle locked to cylinder, without old style clamp bolt, by means of a key in cylinder. Another feature claimed is extra long striking end on the piston, where ⅝ in. is provided instead of the ¼ in. commonly used on clamp bolt types of hammers. This hammer may be furnished with either open or closed handles, piston type of throttle valves, round or hexagon bushings, or other features as specified on order. Made in ten sizes ranging from 1¾-in. to 4-in. stroke with piston diameters of ⅛ to 1⅛ in.

Jacks and Bolt Couplers

Roberts Manufacturing Co., New Haven, Conn.

"American Machinist," Oct. 23, 1919

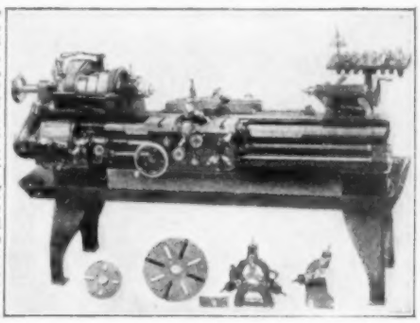


The jacks can be quickly built up to the desired height without the use of bolts or screws as lock joints connect each unit with a simple half turn. Bolt coupler saves making special bolts. Can be used to join two bolts together to get desired length. The equipment not intended for the toolroom, but as part of machine equipment. Jacks made in several sizes having base diameters from 2¼ to 3¼ in. and heights of 2 to 5 in. The extension units have varying lengths of 2 to 6¼ in. Bolt couplers are made for all standard size bolts from ¼ to 1¼ inch.

Lathe, Engine, Quick-Change

Rockford Lathe and Drill Co., Rockford, Ill.

"American Machinist," Oct. 23, 1919

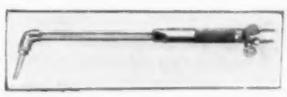


Swing, over ways, 14¼ in., over carriage, 8 in.; distance between centers with 6-ft. bed, 37 in.; lengths of bed, 6 ft., 8 ft. and 10 ft.; spindle bearing (front), 2⅜ x 4 in., (back), 1¼ x 3 in.; hole through spindle, 1⅛ in.; ratio of back gears, 3.42 to 1 and 9.07 to 1; width of belt, 2½ in.; spindle speeds, 20 to 435; will cut threads from 4 to 56 per inch; feeds, 18 to 252 per inch; weight with 6-ft. bed, 1600 lb.; shipping weight, with 6-ft. bed, 1850 pounds.

Torch, Airco Welding

Air Reductions Sales Co., 120 Broadway, New York, N. Y.

"American Machinist," Oct. 23, 1919

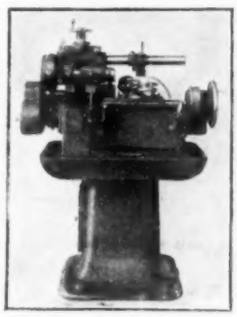


Strong, light construction and easy to handle; has pressure table on handle; both handles on left side; tubes of seamless tubing; mixture automatic; tip of special alloy; drop-forged head; torch made in four sizes.

Gear-Hobbing Machine No. 2

Barber-Coleman Co., Rockford, Ill.

"American Machinist," Oct. 23, 1919

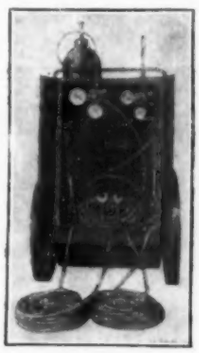


Capacity, diameter, 3 in.; width of face, 7 in.; diametral pitch, 24 and finer; diameter hob spindle, ½ in.; maximum diameter hob, 1¼ in.; taper hole in spindle, No. 9 B. & S.; floor space, 27 in. by 42 in.; driving pulley, 6 in. by 1¾ in.; speed of driving pulley, 800 r.p.m.; number of changes of hob speed, eight; range of hob speeds, 200 to 800 r.p.m.; range of feed per revolution of work, 0.015 to 0.150 in.; net weight, 950 lb.; shipping weight (crated), 1,200 lb.; shipping weight (boxed), 1,360 lb.; measurements of box, 48 x 34 x 62 in.

Truck, Cutting and Welding Outfit

Davis and Bournonville Co., Jersey City, N. J.

"American Machinist," Oct. 23, 1919



Width over all, 31 in.; depth over all, 28 in.; height over all, without cylinders, 45 in.; height, over all, with cylinders, 56 in.; net weight, without equipment, 163 lb.; net weight, with full equipment, 500 lb.; diameter of wheels, 24 in.; face of wheels, 2½ in. The cabinet is so designed that when fully equipped the operator has only to open the doors, take down the torch, turn on and adjust the gases to be ready for work.

Clip, paste on 3 x 5-in. cards and file as desired

require from two to eight months, planing machines from three to six months and boring mills from three to five months. The machines most scarce in the market today are drilling and punching machines, about sixty days being required for delivery.

Collections have been excellent throughout the year and stocks are low; therefore, all dealers are in excellent condition financially. The optimism with which they view the coming year presents a sharp contrast to the feeling pervading the trade last January.

But a small quantity of new industrial enterprises is now being announced in the Chicago district. The Excell Motor Truck Co. has let a contract for the erection of a $300,000 factory and the Chicago Coated Board Co. is contemplating a three-million dollar plant, but the date of commencing work thereon is still undetermined. It is thought that when the holiday lull is passed, industrial announcements will be made with greater frequency.

PHILADELPHIA LETTER

Indications are that 1920 will be the banner year for the machine-tool industry. Practically every line of manufacturing has entered the machine-tool market. The automobile houses and the makers of auto accessories, as usual, lead the field in this respect, but it would be difficult to say just which of the various other kinds of producers rank second in their demands for machine-tool equipment. Even such companies as manufacturers of linoleum and the various silk mills are persistent with inquiries for machinery with which to repair their present supply.

Business is so brisk that machine-tool dealers are perfectly well satisfied to have the railroads, car builders and locomotive plants keep out of the market for the present at least. Delivery has become so much delayed, owing to the tremendous demand for machinery, that an entry now of the railroads with their usual long lists of requirements would only confuse matters rather than help the machine-tool business.

Machine-tool houses experience no fear regarding the disposal of goods on hand. High-grade material is snapped up almost as soon as it appears in a dealer's showroom. Second-hand equipment is inspected a little more critically but this, too, is meeting with a constant demand.

A large manufacturer of power presses is now searching for a four- or five-acre plot of ground near Philadelphia on which to erect a plant having some 100,000 sq.ft. of floor space. Labor conditions in Philadelphia and vicinity are better than where this firm's present plant is now situated.

Turret lathes and disk grinding machines for the manufacture of piston rings are in constant demand, and Philadelphia houses are quoting on June and July delivery for these goods.

The L. R. Meisenhelter Machinery Co., situated at 4th and Arch Sts., suspended operations after the first of the year.

The E. G. Budd Manufacturing Co., manufacturer of auto steel bodies, has recently placed an unusually large order for grinding machines and various other types of machine tools, with a Philadelphia concern.

The Wicaco Screw and Machine Works, 7th and Woods Sts., has denied the rumor that it will take up the manufacture of gear cutters along with its usual machine-screw output.

The Sherritt-Stoer Co., Inc., now holding offices in the Finance Building, will move to its new warehouse and office building at 20th and Market Sts. in about a month.

Personals

W. G. COOKMAN is no longer connected with the United States and Cuban Allied Works Engineering Corporation, 50 Broad St., New York City.

CLYDE W. BLAKESLEE, Chicago manager of the Abrasive Co., has resigned to become associated with the N. A. Strand & Co., as general sales manager, with headquarters in the Machinery Hall Building, Chicago, Ill.

WALTER E. SARGENT, formerly of Detroit, is now connected with the New York sales office of the B. M. Jones & Co., Inc., 192 Chambers St., New York City, selling agents for mushet steels and Taylor iron.

F. W. SINRAM, president of the American Gear Manufacturers' Association, was elected president of the Van Dorn & Dutton Co., Cleveland, Ohio, at the last meeting of the board of directors. Franklin Schneider was elected vice president at the same meeting.

A. A. BLUE has been appointed by the Duff Manufacturing Co., Pittsburgh, to take charge of its heat-treating department. Mr. Blue is a graduate of the chemical engineering department of Cornell University. For two years he was connected with the Midvale Steel Co. in the heat-treating department, and during the war served as assistant superintendent of heat-treating and forge shop of the gun plant at the Watertown Arsenal.

FRANK O. WELLS, president of the Greenfield Tap and Die Corporation, has sold his entire holdings to Frederick H. Payne, vice president. Mr. Wells retires as president and member of the board of directors, and Mr. Payne has been elected president in his place. F. G. Echols, vice president and general manager, has been elected a director of the corporation to fill the vacancy caused by the resignation of Mr. Wells, but Mr. Wells will remain with the corporation in an advisory capacity.

Business Items

The Production Machinery Co., a new corporation that will manufacture machine tools, has leased a newly constructed building at 329-331 East Pearl St., Cincinnati, Ohio.

The Dayton Pipe Coupling Co. has installed additional equipment to its forge department and has 90 x 100 ft. more space to this department. In the machine and tool departments a number of lathes, milling, planing and shaping machines have been added.

Marshall & Huschart Machinery Co., 17 South Jefferson St., Chicago, Ill., has made extensive additions to its office. Space on the ground floor has been glassed in for the sales force, and a rest room for the women employees has been fitted up on the second floor.

The Reising Arms Co., West Hartford, Conn., has been organized to manufacture and deal in machinery, machine parts, etc. The organizers are William Ainslee, of the Ainslee Machine and Tool Works, West Hartford, and J. S. Woodward, 12 King St., Hartford, Conn.

Chas. W. Lawser, president, and Allison Sharp, vice president and treasurer of the Wicaco Screw and Machine Works, have purchased a tract of land at Wayne Junction, Philadelphia, Pa. They are erecting a three-story office building and a two-story factory of 30,000 sq.ft. floor space, fully equipped with modern machinery for the manufacture of screw-machine products and thread milling. This company was established in 1868 and incorporated in 1915.

Forthcoming Meetings

Boston Branch, National Metal Trades Association. Monthly meeting on first Wednesday of each month, alternating with the Employers' Association of eastern Massachusetts. George D. Berry, secretary, room 50-51, 166 Devonshire St., Boston, Mass.

Engineers' Club of Philadelphia. Regular meeting the third Tuesday of the month. Lewis H. Kenney is the chairman of committee on papers.

Electric Hoist Manufacturers' Association. Monthly meeting at the offices of the Yale & Towne Manufacturing Co., 9 East 40th St., New York City. Secretary W. C. Briggs, Shepard Electric Crane and Hoist Co.

Engineers Society of Western Pennsylvania. Monthly meeting, third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Pa.

Philadelphia Foundrymen's Association. Meeting first Wednesday of each month. Manufacturers' Club, Philadelphia, Penn., Howard Evans, secretary, Pier 45, North Philadelphia, Pa.

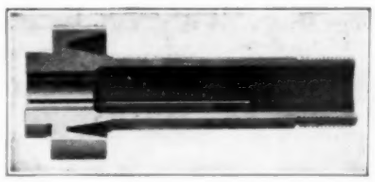
Rochester Society of Technical Draftsmen. Monthly meeting last Thursday. O. L. Angevine, Jr., secretary, 547 Arnett Boulevard, Rochester, N. Y.

The Second Annual Aëronautical Exposition of the Manufacturers Aircraft Association, Inc., will be held at the Seventy-first Regiment Armory, 34th St. and Park Ave., New York, on Mar. 6-13, 1920. S. S. Bradley, 401 Fifth Ave., New York City, is the general manager.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Collet, "In and Out," Double Acting.
Inandout Collet Manufacturing Co., Rochester, New York.
"American Machinist," Oct. 23, 1919

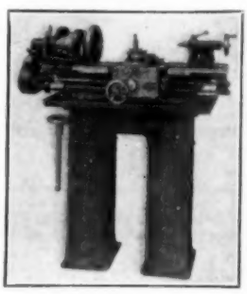


Collet is provided with an integral flange, on the inner surface of which there is a reverse or expanding taper, and the outer surface of the chuck is fitted with standard sized shoulders for holding internal work. By means of adapters which act either on the expanding or the closing taper, chuck may be expanded to grip internal work or contracted for gripping external work, according to which adapter is used.

Screwdriving Outfit.
Hergi Manufacturing Co., Bridgeport, Conn.
"American Machinist," Oct. 23, 1919

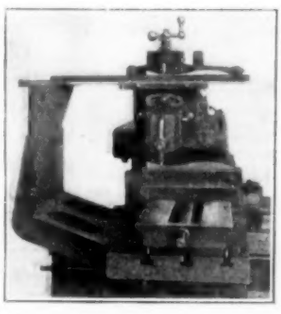
The device is automatic in operation. The screwdriving begins as soon as pressure is applied, and the power is shut off the instant pressure is released; and at the same time a pawl engages the ratchet so as to permit the screw to be set. The power control is all in the hand piece, a friction device being used to apply or release the power. The equipment can be furnished in a number of sizes.

Lathe, Bench, "Dalton Six," Type B6.
Dalton Manufacturing Corp., New York, N. Y.
"American Machinist," Oct. 23, 1919



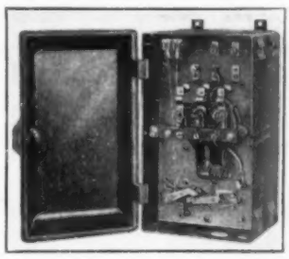
Full cabinet base, semi-cabinet, or with high legs and foot power drive; also bench type. Motor drive furnished when desired. Specifications: Swing over bed, 8¼ in.; over carriage, 5 in.; over rest, 1⅝ in.; between centers, 18½ in.; hole through spindle, 1 1/32 in.; Morse taper No. 2; length of bed, 37 in.; largest cone step, 5¼ in.; width of belt, 1¼ in.; size of motor, ½ hp. Gross weights are: Bench lathe, 340 lb.; with high legs, 465 lb.; semi-cabinet legs, 530 lb.; full cabinet, 640 lb.; bench lathe with motor drive, 550 lb.

Attachment for Shaping Irregular Surfaces.
Stockbridge Machine Co., Worcester, Mass.
"American Machinist," Oct. 23, 1919



Intended for the production of certain types of dies, bending and forming tools for forging work, also special forming tools or cams for automatics and other machines. The irregular surfaces of solid dies may be finished to advantage and with split dies duplication of surfaces made from the one form can be accomplished at a considerable saving over old methods. The cutting tool is directly beneath the follower and is raised and lowered as the follower moves along the path of the templet and as a result reproduces its curves and angles, not only once, but over and over again, at one setting.

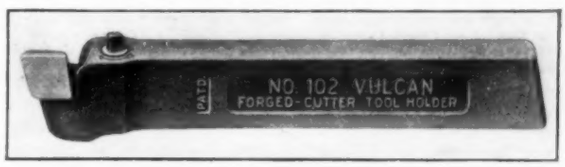
Switch, A.-C. Starting.
Electric Controller and Manufacturing Co., Cleveland, Ohio.
"American Machinist," Oct. 23, 1919



The protective principle used consists of two wires connected to an auxiliary circuit-breaker. The expansion of these wires caused by excessive flow of current will open auxiliary circuit-breaker, and cause main switch to open the line. To close the main switch again, push the start button. A stop button is also provided for use when required. The motor can be started or stopped at will by manipulating the push-buttons.

Toolholders, Vulcan No. 102.
J. H. Williams & Co., Brooklyn, New York.
"American Machinist," Oct. 23, 1919

These toolholders are introduced to meet demand for solid forged type of tool. They are an addition to the "Agrippa" line; said to be the same in principle as solid forged tool, except that cost is less. Drop-forged from high-grade steel and heat-treated.



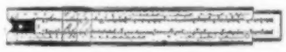
Composed of but three parts—holder, square-head cam, and locking pin. Line includes wide range of cutters made from high-speed steel, adapted for regular machining operation on a lathe, planing or shaping machine.

Masks, Face.
Julius King Optical Co., New York, N. Y.
"American Machinist," Oct. 23, 1919

For the protection of autogenous cutters and welders. Masks are made of fiber; provision for free circulation of air between front and the face, keeping the operator cool, prevents tendency of lenses to fog. Supported by bands over the head; weight not apparent; are as comfortable to wear as a cap. Two styles made—with and without side screens. One without screens may be had with combination lenses tinted for acetylene welding or with any other tint. That with side screens fitted either with combination lenses or with clear Saniglass lenses.

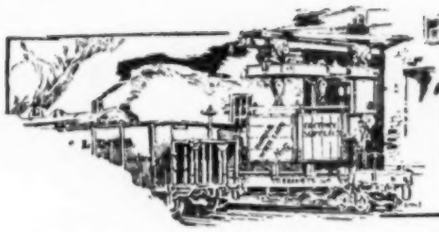
Slide Rule.
Knief & Co., Chicago, Ill.
"American Machinist," Oct. 23, 1919

The metal used is nickel-silver, to which is glued the white celluloid graduated facings. The body or frame of the rule is



die cast and guaranteed by the makers to be accurate and to remain so; also that the rule can be manufactured at a much lower cost than the wooden-frame rules.

Clip, paste on 3 x 5-in. cards and file as desired



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co., as per Department of Commerce Committee Schedule.

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$39.10	$36.60
Northern Basic	38.20	34.00
Southern Ohio No. 2	40.80	36.55
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	45.65	39.40
Southern No. 2 (Silicon 2.25 to 2.75)	43.20	41.40
BIRMINGHAM		
No. 2 Foundry	35.50	33.00
PHILADELPHIA		
Eastern Pennsylvania No. 2	42.50*	38.10
Virginia No. 2	40.00*	39.10
Basic	40.00†	34.60
Grey Forge	39.50*	34.60
CHICAGO		
No. 2 Foundry local	40.00	36.25
No. 2 Foundry, Southern	40.50	38.00
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	39.40	.....
Basic	36.40	34.40
Bessemer	37.40	35.40

* F. o. b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$3.47	$3.47	$4.27	$3.27–2.32	$4.17	$3.47	$4.27
Soft steel bars	3.52	3.52	4.17	3.52	4.17	3.52	4.17
Soft steel bar shapes	3.52	3.52	4.17	3.57–3.82	4.17	3.52	4.17
Soft steel bands	4.22	4.22	4.77	.....	.....	.....	.....
Plates, ¼ to 1 in. thick	3.67	3.67	4.52	3.37–3.62	4.42	3.67	4.25

Note—For less than carload lots, add 4½c. per 100 lb.

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$3.50	$3.50
Warehouse, New York	3.52	4.75
Warehouse, Cleveland	3.42	4.67
Warehouse, Chicago	3.52	4.10

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

	Mill Carloads, Pittsburgh	New York		Cleveland	Chicago
		Current	One Year Ago		
No. 28 black	$4.35–4.85	$7.00–8.00	$6.52	$5.77	$6.00
No. 26 black	4.25–4.75	6.90–7.90	6.42	5.67	5.90
Nos. 22-24 black	4.20–4.71	6.85–7.85	6.37	5.62	5.85
Nos. 18-20 black	4.15–4.65	6.80–7.80	6.32	5.57	5.80
No. 16 blue annealed	3.75–4.20	5.27	5.72	5.17	5.02
No. 14 blue annealed	3.65–4.10	5.17	5.62	5.07	4.92
No. 10 blue annealed	3.55–4.00	5.07–6.00	5.52	4.97	4.82
No. 28 galvanized	5.70–6.20	7.75–9.00	7.77	7.12	7.25
No. 26 galvanized	5.40–5.90	7.45	7.47	6.82	6.95
No. 24 galvanized	5.25–5.75	7.30	7.32	6.57	6.52

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$5.00	$4.90	$5.00
Flats, square and hexagons, per 100 lb. base	5.50	5.40	.....

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	50
Cleveland	50
Chicago	50

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$21.00–26.00	$19.00
Cleveland	20.00	20.00
Chicago	16.50	19.00

In coils an advance of 50c. usually is charged.
Domestic iron (Swedish analysis) is selling at 15c. per lb.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100 lb. lots and over:

Welding Wire		Cast-Iron Welding Rods	
1/4, 11/64, 3/16, 1/8, 7/64, 1/16	21.00 to 30.00	1/16 by 12 in. long	14.00
No. 8, 1/32 and No. 10		1/8 by 19 in. long	12.00
1/4		3/16 by 19 in. long	10.00
No. 12		1/4 by 21 in. long	10.00
5/16, No. 14 and 1/16		**Special Welding Wire, Coated**	
No. 18		1/8	33.00
No. 20		3/32	30.00
Domestic 20c. for 1/16, 15c. for 1/8 to 5/16		1/16	38.00

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	6.00	8.00	8.00
Spring steel (light)	8.00	10.00	10.00
Coppered bessemer rods	8.00	8.00	6.75
Hoop steel	4.47	4.75	4.07
Cold-rolled strip steel	8.40	8.25	7.50
Floor plates	6.30	6.00	5.92

Note—For less than carload lots, add 4½c. per 100 lb.

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of National Tube Co. for steel pipe, Cardry A. M. Byer's Co. for iron, both dated Mar. 21, 1919.

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
BUTT WELD					
1/8, 1/4 and 3/8	50½%	24%	1/4 to 1 1/4	30%	23½%
1/2	54½%	40%			
3/4 to 3	57½%	44%			
LAP WELD					
2	50½%	35%	2	32½%	18½%
2½ to 6	53½%	41%	2½ to 6	34½%	21½%
BUTT WELD, EXTRA STRONG PLAIN ENDS					
1/8, 1/4 and 3/8	46½%	29%	1/4 to 1/2	39½%	24½%
1/2	51½%	39%			
3/4 to 1 1/4	55½%	43%			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	48½%	37%	2	33½%	20½%
2½ to 4	51½%	49%	2½ to 4	.....	23½%
4½ to 6	50½%	39%	4½ to 6	34½%	22½%

Stock discounts in cities named are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
⅛ to 3 in. steel butt welded	47%	31%	43½%	34½%	57½%	44%
2½ to 6 in. steel lap welded	42%	27%	45½%	39½%	53½%	41%

Malleable fittings. Class B and C, banded, from New York stock sell at plus 18%. Cast iron, standard sizes, net.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	19.375	20.00	26.00
Tin in 5-ton lots	63.00	53.87½	72.00
Lead	9.00	6.80	7.05
Spelter	9.75	8.30	8.60
ST. LOUIS			
Lead	7.50	6.55	6.75
Spelter	8.87½	7.95	8.25

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

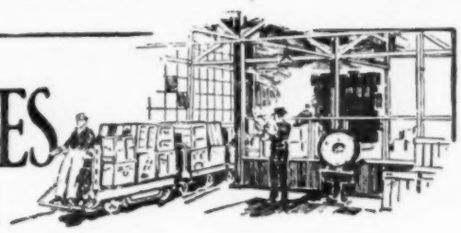
	New York			Cleveland		Chicago	
	Current	Month Ago	Year Ago	Current	Year Ago	Current	Year Ago
Copper sheets, base	29.00	33.50	38.00	29.50–31.00	38.00	35.00	38.00
Copper wire (carload lots)	28.25	29.00	35.00	28.50	35.00	26.00	38.00
Brass sheets	25.50	32.00	39.75	28.00	30.50	26.00	38.00
Brass pipe	32.00	36.00	46.00	34.00	42.50	34.00	44.00
Solder (half and half) (case lots)	35.00	45.00	55.00	35.50	47.50	33.00	65.00

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill. 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	22.75	36.00
New York	22.75	38.40
Cleveland	28.00	38.50
Chicago	25.00	29.50

SHOP MATERIALS AND SUPPLIES



ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill 11.50

	In Casks		Broken Lots	
	Current	One Year Ago	Current	One Year Ago
Cleveland	14.50	18.75	15.00	21.50
New York	13.50	17.00	14.00	20.25
Chicago	15.00	22.00	15.00	21.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	10.25	9.50–10.50
Chicago	10.50	10.00
Cleveland	11.75	11.625

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York		Cleveland		
	Current	One Year Ago	Current	One Year Ago	Chicago
Copper, heavy and crucible	18.00	18.00	18.50	21.00	17.25
Copper, heavy and wire	17.50	17.00	19.00	21.00	16.75
Copper, light and bottoms	15.75	15.00	15.50	19.00	15.75
Lead, heavy	7.00	5.00	6.50	6.00	6.50
Lead, tea	5.00	4.00	4.50	5.00	5.50
Brass, heavy	9.00	9.50	14.00	14.50	17.00
Brass, light	8.00	8.50	10.50	11.50	10.00
No. 1 yellow brass turnings	9.50	10.00	11.00	13.50	10.50
Zinc	6.75	5.00	5.00	5.50	6.00

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	33.00c.	34.00c.@35.00c.	33½c.

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	34.00	40.00
Chicago	28.00	40.00
Cleveland	31.00	33.50

BABBITT METAL—Warehouse price per pound:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	90.00	95.00	68.50	93.00	60.00	96.00
Commercial	50.00	50.00	17.25	23.00	13.00	25.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	List	.80	$1.00	$1.25	$1.45	.98
Hot pressed hexagon	List	.80	1.00	1.05	1.45	.78
Cold punched hexagon	List	2.50	1.00	.75	1.05	1.00
Cold punched square	List	2.50	1.00	.75	1.05	1.00

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	70–5%	50–10%
Chicago	50%	50%
Cleveland	60–10%	50–10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	30%	50%	35–5%
Larger and longer up to 1¼ in. by 30 in.	20%	40%	25–5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York..... $1.50 Cleveland..... $3.75 Chicago..... $3.00

For cast-iron washers the base price per 100 lb. is as follows:

New York..... $7.00 Cleveland..... $3.75 Chicago..... $4.25

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	25%	40–5%	30%
Larger and longer up to 1 in. by 30 in.	15%	37½%	20%

COPPER RIVETS AND BURS sell at the following rate from warehouse.:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	30%	List plus 10%	30%	List plus 10%
Chicago	20%	List price	20%	List plus 20%
New York	10%	15% from list	10%	List plus 5%

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ½ and smaller	40%	55% off	50%
Tinned	40%	55% off	50%

Boiler, ½, ¾, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York...$5.00 Cleveland...$4.00 Chicago....$4.87 Pittsburgh...$4.72

Structural, same sizes:

New York...$5.10 Cleveland...$4.10 Chicago . . $4.97 Pittsburgh....$4.82

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	33.50	36.00	35.00
Brass	32.00	34.00	34.00

For immediate stock shipment 3c. is usually added. The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb., advance is 5c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 10c. should be added to base price; quantities from 10-25 lb., extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ½-2 in. inclusive in rounds, and ½-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

COTTON WASTE—The following prices are in cents per pound:

	NEW YORK			
	Current	One Year Ago	Cleveland	Chicago
White	13.00	11.00–13.00	14.00	11.00 to 14.00
Colored mixed	9.00 to 12.00	8.50–12.00	11.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	52.00	58.00
Chicago	41.00	45.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.25	$2.25	$1.75
Philadelphia	2.00	2.00	1.75
Cleveland	2.50	2.50	2.625
Chicago	2.00	2.00	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.40	$3.40	$3.65
Cleveland	4.625	3.875	4.25
Chicago	4.12½	4.125	4.50

COKE—The following are prices per net ton at ovens, Connellsville:

	Jan. 2	Dec. 9	Dec. 2
Prompt furnace	$6.00	$6.00	$6.50
Prompt foundry	7.00	7.00	7.00

FIRE CLAY—The following prices prevail:

	Current
Ottawa, bulk in carloads	Per Ton $8.00
Cleveland	375-lb. bag 2.50

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	One Year Ago	Current	One Year Ago
Raw in barrels (5 bbl. lots)	$1.80	$1.59	$1.98	$1.90
5-gal. cans	2.00	1.84	2.23	2.00

WHITE AND RED LEAD—Base price per pound:

	Red				White			
	Current		One Year Ago		Current		One Year Ago	
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	14.50	15.50	14.00	15.50	14.50	14.00		
25 and 50-lb. kegs	14.75	15.75	14.25	15.75	14.75	14.25		
12½-lb. keg	15.00	16.00	14.50	16.00	15.00	14.50		
5-lb. cans	....	17.50	.....	.....	16.50	16.00		
1-lb. cans	....	18.50	.....	.....	17.50	17.00		

500 lb. lots less 10% discount. 2000 lb. lots less 10–2½% discount.

NEW AND ENLARGED SHOPS

Consult the Buying Section when in need of machinery or supplies

Metal Working

NEW ENGLAND STATES

Conn., Bridgeport—The Crane Co., 836 South Michigan Ave., Chicago, Ill., manufacturer of valves and plumbing supplies, is building a 3 story, 80 x 500 ft. factory, at their West End plant, here.

Conn., Bridgeport — I. Pick, c/o A. E. Fischer, Archt., 373 Fulton St., Brooklyn, N. Y., is having plans prepared for a 1 story factory, for the manufacture of silverware.

Conn., Bristol—F. P. O'Brien, 39 Main St., has awarded the contract for the construction of a 1 story, 85 x 101 ft. garage. Estimated cost, $25,000.

Conn., Manchester — Fitzgerald Bros., Maple Ave., plan to build a 1 story, 65 x 104 ft. garage on Main St. Estimated cost, $25,000.

Conn., Stratford (Bridgeport P. O.)—The Albert Peck Co., Bruce Ave., will build a 2 story, 67 x 180 ft. factory, for the manufacture of silverware. Estimated cost, $50,000.

Me., Biddeford—The Saco Lowell Shops, 77 Franklin St., Boston, manufacturer of textile machinery, will soon award the contract for the construction of a 1 story, 160 x 200 ft. foundry. Lockwood, Greene & Co., 60 Federal St., Boston, Mass., Archts.

Mass., Holyoke—The Century Machine Co., manufacturer of dish washing machines, will soon award the contract for the construction of a 2 story, 50 x 90 ft. and a 1 story, 90 x 200 ft. factory, on Main St.

MIDDLE ATLANTIC STATES

Md., Baltimore—The Champion Motors Corp., has purchased a 3 acre site, on Eastern Ave. and Canton Ry., and plans to build a factory for the manufacture of automobiles.

N. J., Hoboken—The White Metal Mfg. Co., 1006 Clinton St., manufacturer of tin tubing, is having plans prepared by J. C. Schaeffler & Co., Engrs., 38 West 32nd St., New York City, for the construction of a 6 story, 135 x 135 ft. factory and a 2 story, 20 x 80 ft. foundry.

N. Y., New York (Borough of Bronx)—J. Jordis, c/o W. Koppe, Archt., 935 Intervale Ave., will build a 1 story, 100 x 175 ft. garage, on Woodlock and Leggett Sts. Estimated cost, $50,000.

N. Y., New York (Borough of Bronx)—The Rosewater Realty Corp., 51 Chamber St., will build a 5 story, 75 x 90 ft. garage, on Prospect Ave. and 169th St. Estimated cost, $85,000. H. Rosenwasser, Pres.

N. Y., New York (Borough of Brooklyn)—Knoor Bros., 1116 Wykoff Ave., will build a 1 story, 80 x 90 ft. brass foundry on Cooper Ave. along tracks of the Long Island Ry. Estimated cost, $30,000.

N. Y., New York (Borough of Manhattan)—S. B. Bowman Automobile Co., 225 West 49th St., has awarded the contract for the construction of a 3 story, 100 x 200 ft. garage, salesroom and service station, on Broadway, 131st and 132nd Sts.

N. Y., New York (Borough of Manhattan)—The Mildon Realty Co., 362 West 23rd St., will build a 2 story, 75 x 92 ft. garage ,at 447 West 17th St. Estimated cost, $25,000. G. M. McCabe, 96 5th Ave., Archt.

N. Y., New York (Borough of Queens)—J. H. Baker, Archt., 9 Jackson Ave., Long Island City, will soon award the contract for the construction of a 1 story, 100 x 100 ft. garage, on Mott and Harris Sts., for J. J. Daly. Estimated cost, $25,000.

N. Y., Syracuse—The Brown Lipe Chapin Co., 110 Seneca St., plans to build a 6 story, 70 x 300 ft. factory, on West Fayette St., for the manufacture of automobile gears. Estimated cost, $300,000.

N. Y., Syracuse — The Globe Malleable Iron and Steel Co., 101 Greenway Ave., plans to build a 1 story factory. Estimated cost, $750,000.

Penn., Philadelphia — C. E. Dearnley Bros. Worsted Spinning Co., Inc., Main St. near Walnut Lane, is having plans prepared by F. V. Nichels, Archt., 4400 Manayunk St., for the construction of a 1 story, 30 x 60 ft. and a 40 x 40 ft. garage and tire house, on Baynton and Chelton Sts. Estimated cost, $10,000.

Penn., Philadelphia—H. Weinrich, c/o Greisler & Abransom, Archts., Lafayette Bldg., will soon award the contract for the construction of a 1 story, 60 x 200 ft. garage, on 3rd and Cambridge Sts. Estimated cost, $20,000.

MIDDLE WEST

Ill., Chicago—The Exel Motor Truck Co., c/o H. Raeder, Archt., 20 West Jackson Bldg., has awarded the contract for the construction of a 1 story, 370 x 500 ft. factory, on Meisard and Dickens Aves. Estimated cost, $300,000.

Ill., Chicago—The Hansell Elcock Co., Archer and Normal Aves., iron workers, has purchased a 25,000 sq.ft. site, on the corner of Normal Ave. and 25th St., and plans to build an addition to its plant.

Ill., Chicago—The Hudson Motor Car Co., 1615 South Michigan Ave., will soon award the contract for the construction of a 3 story, 200 x 400 ft. automobile sales and service station, on Michigan Ave., near 22nd St. Estimated cost, $300,000. A. S. Alschuler, 28 East Jackson St., Archt.

Ill., Chicago—The Packard Auto Open Body Co., c/o S. S. Joy, Archt., 2001 West 39th St., has awarded the contract for the construction of a 3 story, 120 x 400 ft. factory, on East 104th St. and Erickson Ave. Estimated cost $1,000,000.

Ill., Chicago—The E. H. Wachs Co., 1525 Dayton St., manufacturer of engines, has awarded the contract for the construction of a 2 story, 100 x 125 ft. factory, at 1531 Dayton St. Estimated cost, $55,000.

Mich., Detroit—The Barton Auto Top Co., Woodward Ave., has awarded the contract for the construction of a 1 story, 50 x 300 ft. garage, on Rich St. Estimated cost, $30,000.

Mich., Detroit—The Commerce Motor Car Co., Mackie St., is having plans prepared by F. J. Winter, Archt., Dime Bank Bldg., for the construction of a 1 story factory, on Solvay and Mackie Aves. Estimated cost, $75,000.

Mich., Detroit—The Liberty Investment Co., Beaubien St., will soon award the contract for the construction of a 1 story, 50 x 70 ft. garage, on Beaubien and Warren Aves. Estimated cost, $10,000. M. H. Finkel, 305 Chamber of Commerce Bldg., Archt.

Mich., Galesburg—The Kalamazoo Chain Co. plans to build a 2 story, 80 x 125 ft. factory, for the manufacture of tire chains. Estimated cost, $20,000.

Mich., Muskegon Heights (Muskegon P. O.)—The Shaw Electric Crane Wks., McKinney St., plans to build a 1 and 2 story plant for the manufacture of gasoline engines. Estimated cost, $2,000,000. Manning, Maxwell & Moore, McKinney St., Engrs.

O., Cincinnati—The Witt Cornice Co., Winchell St., manufacturer of corrugated cans, will soon award the contract for the construction of a 1 story, 40 x 100 ft. factory. S. Hannaford & Sons, 6th and Vine Sts., Archts.

O., Cleveland — The American Stove Co., 5017 Perkins Ave., has awarded the contract for the construction of a 3 story, 55 x 160 ft. factory, at 4415 Hough Ave., a 3 story, 60 x 120 ft. factory, at 1787 East 40th St., and a 1 story, 45 x 211 ft. addition to warehouse, at 5017 Perkins Ave. Total estimated cost, $200,000.

O., Cleveland—The Bissinger Magneto Co., 2352 Euclid Ave., will soon award the contract for the construction of a 1 and 2 story, 120 x 134 ft. garage and workshop, on East 21st St. and Chester Ave. Estimated cost, $60,000. Grieble & Eberling, 517 Sloan Bldg., Archt. Noted Jan. 23.

O., Cleveland—Bd. Educ., 6th St. and Rockwell Ave., is having plans prepared by W. R. McCormack, Archt., East 6th St. and Rockwell Ave., for the construction of a 2 story, 128 x 254 ft. high school, on East 118th St. and Hopkins Ave., to include a manual training department. Estimated cost, $500,000.

O., Cleveland — The Champion Forge and Machine Co., East 71st St. and Union Ave., has had plans prepared by E. McGeorge, Engr. and Archt., 1900 Euclid Ave., for the construction of a 3 story, 60 x 120 ft. factory. Estimated cost, $100,000.

O., Cleveland—The Champion Machine and Forge Co., 3725 East 78th St., has awarded the contract for the construction of a 1 story, 73 x 160 ft. addition to its factory. Estimated cost, $50,000.

O., Cleveland—The Cleveland Twist Drill Co., East 49th St. and Lakeside Ave. plans to build a 1 story factory on Euclid Ave. Estimated cost, $100,000. J. D. Cox, Mgr.

O., Cleveland — The Crucible Steel Forge Co., 6600 Grant Ave., will soon award the contract for the construction of a 1 story, 60 x 900 ft. factory, machine shop and warehouse. Estimated cost, $300,000. J. H. Herron, West 3d St. and St. Clair Ave., Engr. and Archt.

O., Cleveland — The Draper Mfg. Co., 3603 East 82d St., will soon award the contract for the construction of a 1 story, 111 x 202 ft. factory, on East 91st St., for the manufacture of steel barrels. Estimated cost, $75,000. W. S. Ferguson Co., 1900 Euclid Ave., Archt.

O., Cleveland — The Eaton Axle Co., 10,017 Euclid Ave., has awarded the contract for the construction of a 1 story, 300 x 450 ft. factory and a 40 x 80 ft. power house, on East 140th St., along tracks of New York Central R. R. Estimated cost, $600,000.

O., Cleveland—The Ohio Heating and Pipe Bending Co., 1063 West 11th St., plans to build a 1 story, 80 x 100 ft. factory, on West 86th St. and Denison Ave. Estimated cost, $50,000. B. W. Neyhard, Secy.

O., Cleveland — The Paramount Brass Co., 1391 East 33d St., has awarded the contract for the construction of a 1 story, 40 x 120 ft. factory. Estimated cost, $10,000.

O., Cleveland — The L. Sands Co., 5407 Sweeney Ave., manufacturer of water heaters, has had plans prepared by E. McGeorge, Engr. and Archt., 1900 Euclid Ave., for the construction of a 2 story, 60 x 80 ft. addition to its factory, on East 55th St. and Sweeney Ave. Estimated cost, $50,000.

O., Cleveland — G. A. Tenbush, Union Bldg., will soon award the contract for the construction of an 8 story, 92 x 119 ft. garage, on Huron Rd. and East 12th St. Estimated cost, $500,000. W. S. Ferguson Co., 1900 Euclid Ave., Archt.

O., Cleveland—The Wheeler Radiator Mfg. Co., 1637 Collamer Rd., has awarded the contract for the construction of a 1 story, 40 x 144 ft. factory. Estimated cost, $25,000. E. F. Harlinger, Secy.

O., Dayton — The Buick Automobile Sales Co., 130 North Main St., has awarded the contract for the construction of a 2 story, 75 x 200 ft. garage and automobile sales station, on South Main St. Estimated cost, $150,000. Noted Mar. 13.

O., Dayton — The Carrol Eng. Co., 2d and Ludlow Sts., manufacturer of machine tools, plans to build a 2 story, 150 x 250 ft. factory, on Xenia Ave. Estimated cost, $125,000.

Wis., Cleveland—The Cleveland Welding & Mfg. Co., will build a 2 story, 60 x 120 ft. garage and foundry, on Main St.

Wis., Iola—J. A. Rosholt plans to build a 2 story, 66 x 110 ft. garage and salesroom, on Main St. Estimated cost, $52,000.

Wis., Milwaukee—Herbst & Kuenzli, Archts. and Engrs., Caswell Bldg., will soon award the contract for the construction of a 1 story, 120 x 150 ft. garage and repair shop, on North Ave., for the R. & S. Realty Co. Estimated cost, $85,000.

Wis., Two Rivers—The Van Lent Motor Sales Co. has awarded the contract for the construction of a 2 story, 50 x 125 ft. garage, estimated cost, $55,000; also a 2 story, 60 x 120 ft. garage, on Washington St., cost, $50,000.

Wis., Waterford—L. L. Tindoll is having plans prepared by M. F. White, Archt., 683 29th St., Milwaukee, for the construction of a 2 story, 60 x 190 ft. garage, on Main St. Estimated cost, $50,000.

WEST OF THE MISSISSIPPI

Iowa, Davenport—M. F. Heyer, 709 Perry St., manufacturer of sausage and similar products, plans to build a 2 story, 65 x 150 ft. factory and packing house. Estimated cost, between $40,000 and $60,000.

Minn., Minneapolis — State Highway Comn., St. Paul, will build a 1 story, 100 x 150 ft. garage, on the state fair grounds, here. Estimated cost, $50,000. C. H. Johnson, Capital Life Bldg., St. Paul, Archt.

Mo., St. Louis—The Bridge & Beach Stove Co., 1st and Valentine St., manufacturer of stoves, has awarded the contract for the construction of a 7 story molding shop, a 3 story, 152 x 200 ft. warehouse, a 3 story, 50 x 60 ft. mounting shop, a 1 story, 25 x 60 ft. boiler house, a 4 story, pattern storage building, a 1 story, enameling and oven room and a 1 story pattern shop. Total estimated cost, $430,000.

Tex., Houston—J. Stadtler, 803 Fannin St., plans to build a 2 story, 50 x 125 ft. automobile supply station, on Milam St. Estimated cost, $35,000.

Tex., Houston—The Standard Printing Co., 1016 Capitol Ave., is having plans prepared by M. J. Sullivan, Archt., 612 Carter Bldg., for the construction of a 2 story, 112 x 125 ft. factory, at 1203-11 Capitol Ave.

WESTERN STATES

Cal., Los Angeles—Barker Bros., 219 Laughlin Bldg., plans to build a 3 story, 50 x 140 ft. warehouse and factory, on Hewitt and Palmetto Sts. Estimated cost, $50,000. W. J. Saunders, 219 Laughlin Bldg., Archt.

Cal., Los Angeles—The Peerless Laundry Co., 5821 Woodlawn Ave., has awarded the contract for the construction of a 1 story, 50 x 235 ft. laundry, on Woodlawn and Slauson Aves. Estimated cost, $47,000.

Cal., Oakland—The Niedringhaus Metalware Corp., c/o The Western Steel Package Co., foot of Webster St., Alameda, has organized a new company, with $1,200,000 capital stock and plans to build a factory, here, for the manufacture of automobile bodies, airplanes and automobile accesories.

Wash., Seattle—Moran Bros., 2763 1st Ave., S., plans to build a 1 story, 60 x 148 ft. machine shop. Estimated cost, $7,000.

CANADA

Ont., Merrilton—The Canadian Steel and Forging Co. plans to build a factory. Estimated cost, $200,000. J. J. Wernette, 441 Houseman Bldg., Grand Rapids, Mich., Archt.

Ont., Windsor—The Burroughs Adding Machine Co., Ltd., McDougal Ave., will soon award the contract for the construction of a 3 story factory and office. Estimated cost, $300,000. A. Kahn, Walker Rd. and Ottawa St., Walkerville, Archt.

General Manufacturing

NEW ENGLAND STATES

Conn., Hartford—The Hartford Rubber Wks., Park and Bartholomew Aves., has awarded the contract for the construction of a 5 story, 129 x 296 ft. factory, a 6 story, 60 x 140 ft. administration building, and a 3 story, 80 x 120 ft. building for employees. Estimated cost, $2,225,000.

Conn., Saugatuck—The Dolge Disinfecting Co., Westport, has awarded the contract for the construction of a 1 and 2 story, 50 x 100 ft. factory, for the manufacture of disinfectants. Estimated cost, $35,000.

Conn., Seymour—The L. E. Waterman Co. is building a 6 story factor for the manufacture of fountain pens. Estimated cost, $155,000.

Me., Portland—J. A. Huston & Co., Inc., Auburn, is building a 7 story, 110 x 120 ft. bakery, on Forest Ave., here. Estimated cost, $500,000.

Mass., Holyoke—The Perfect Safety Paper Co., Winter St., has awarded the contract for the construction of a 1 story, 50 x 50 ft. addition to its plant. Estimated cost, $15,000.

Mass., Worcester—Christopher Bros., 112 Southbridge St., plans to build a 2 story, 46 x 50 ft. ice cream plant, at 138 Southbridge St. Estimated cost, $20,000. Fuller & Delano, 44 Front St, Archts.

Mass., Pittsfield—The General Electric Co., Morningside, will soon award the contract for the construction of a 1 story enameling plant. Estimated cost, $200,000. C. C. Chesney, Mgr.

MIDDLE ATLANTIC STATES

Md., Curtis Bay (Baltimore P. O.)—The Armour Fertilizer Co., 1501 Munsey Bldg., Baltimore, has awarded the contract for the construction of a factory, here. Estimated cost, $2,000,000.

Md., Havre de Grace—E. M. Smith plans to build a plant for the manufacture of bricks.

Md., Sparrows Point (Baltimore P. O.)—The Bethlehem Steel Corp. has awarded the contract for the construction of a 1 story, 50 x 92 ft. box factory, here. Estimated cost, $35,000.

N. J., Trenton—The Ajax Rubber Co., Breunig Ave., plans to build a 3 story, 60 x 350 ft. factory. Estimated cost, $39,000. H. M. Baer, 101 Park Ave., New York City, Archt.

N. Y., Attica—The Merrell Soule Co., North Franklin and Plum Sts., Syracuse, manufacturer of "None Such" mince meat and "Klim" powdered milk, is building a 3 story, 45 x 74 ft. factory, here.

N. Y., Delevan—The Merrel-Soule Co., North Franklin and Plum Sts., Syracuse, is building a 21 x 60 ft. boiler house and a 2 story, 60 x 100 ft. factory, here, for the manufacture of "Klim" powdered milk.

N. Y., Massena—J. Dunlop Sons Co., 19 Madison Ave., New York City, manufacturer of silk, has purchased 2 foundry buildings, here, and plans to build an addition and alter same, for its own use. Estimated cost, $100,000. A. L. Brockway, 3d National Bank Bldg., Syracuse, Archt.

N. Y., New York (Borough of Brooklyn)—The Manifold Supply Co., 188 3d Ave., manufacturer of typewriter supplies, will build a 2 story, 80 x 100 ft. factory and office building at 172 3d Ave. Estimated cost, $65,000.

N. Y., New York (Borough of Brooklyn)—Rigney & Co., 348 Park Ave., has awarded the contract for the construction of a 6 story, 75 x 90 ft. factory, on Steuben and Park Aves., for the manufacture of candy.

N. Y., New York (Borough of Manhattan)—E. C. DeWitt, 212 5th Ave., manufacturer of chemicals, has awarded the contract for alterations to his factory, at 244 East 52nd St. Estimated cost, $50,000.

N. Y., Utica—P. E. Hoffman, 2234 Whitesboro St., manufacturer of concrete building blocks, plans to build a 1 story, 50 x 500 ft. factory, on Sunset Ave. Estimated cost between $40,000 and $45,000.

Penn., Lewiston—The Viscose Co., Marcus Hook, manufacturer of artificial silk, plans to build a plant, here, to consist of 5 buildings for factory purposes, also houses for employees. Estimated cost, $2,000,000. Ballinger & Perrot, 17th and Arch Sts., Philadelphia, Archts.

Penn., Plymouth—The Stave Silk Co. has awarded the contract for the construction of a 1 story, 73 x 100 ft. mill, on Main St. Estimated cost, $50,000.

Penn., Scranton—The Heath Silk Co., Connell Bldg., plans to build a 3 story, 50 x 200 ft. mill, on Maple and Meadow Aves. Estimated cost, $90,000. G. M. Edson, Connell Bldg., Archt.

SOUTHERN STATES

Ala., Talladega—The Chrinnabee Valley Mills plan to build a 1 story, 132 x 340 ft. cotton mill. J. E. Sirrine, Greenville, S. C., Archt.

Ky., Newport—The Richardson Taylor Printing Co., 1117 Harrison Ave., has awarded the contract for the construction of a 4 story factory. Estimated cost, $120,000.

La., New Orleans—E. W. Marland, Ponca City, Okla., plans to build a large refinery here, with necessary pipe lines to North Louisiana oil fields, also build and equip a large line of tank steamers. Estimated cost, $7,000,000.

Va., Richmond—The Rennie Dairy Co., 7th and Leigh Sts., has awarded the contract for the construction of a 2 story, 45 x 70 ft. dairy, on West 7th St. Estimated cost, $55,000.

MIDDLE WEST

Ill., Chicago—The Continental Can Co., 111 West Washington St., has awarded the contract for the construction of a 1 story, 90 x 170 ft. factory, on Ashland Ave. near 38th St. Estimated cost, $175,000.

Ill., Chicago—The Economy Fuse and Mfg. Co., 328 West Kinzie St., will soon award the contract for the construction of a 2 story, 125 x 190 ft. factory, a 2 story, 47 x 95 ft. office building, a 1 story, 47 x 66 ft. boiler house and garage and a 1 story addition to boiler room, at 2701 Greenview Ave. Estimated cost, $150,000. W. G. Uffendel, 39 South State St., Archt.

Ill., Chicago—The United States Graphite Co., 80 East Jackson Blvd., will soon award the contract for the construction of a 1 story, 75 x 80 ft. factory, on East 94th St. and Commercial Ave. Estimated cost, $25,000. R. G. Pierce, 10 South La Salle St., Archt.

Ill., Clearing (Chicago P. O.)—P. J. Kalman & Co., 29 South La Salle St., manufacturer of railway supplies, etc., has awarded the contract for the construction of a 1 story, 164 x 176 ft. addition to its factory. Estimated cost, $45,000.

Ill., Moline—The Crandall Transfer Co., 410 16th St., has awarded the contract for the construction of a 6 story, 82 x 116 ft. warehouse, on 12th St. and 4th Ave. Estimated cost, $150,000.

Ill., Quincy—The Monroe Drug Co., 601-11 North 4th St., has had plans prepared by Lockwood Greene Co., Engrs., 38 South Dearborn St., for the construction of a 3 story, 60 x 175 ft. drug factory. Estimated cost, $200,000.

Ill., Rockford—The Rockford Paper Box Board Co., Catherine St., has awarded the contract for the construction of a 3 story, 100 x 100 ft. factory. Estimated cost, $85,000.

Ind., Indianapolis—The Vonnegut Mchy. Co., 43 South Meridan Ave., manufacturer of machine tools, factory equipment, etc., has awarded the contract for the construction of a 2 story, 100 x 300 ft. factory, at 19-29 West South St. Estimated cost, $300,000.

Mich., Detroit—The Detroit Graphite Co., 12th St., is having plans prepared by E. R. Dunlop, Archt., 709 Hammond Bldg., for the construction of a 2 story factory, on Linsdale Ave., for the manufacture of paint. Estimated cost, $30,000.

Mich., Yale—The Yale Woolen Mills will soon award the contract for the construction of a 3 story, 60 x 300 ft. addition to its mill. Estimated cost, $100,000. H. H. Lane, 2320 Dime Bank Bldg., Detroit, Archt. and Engr.

O., Cleveland—Chilcote-Sargent Co., 723 Prospect Ave., manufacturer of photo supplies, has awarded the contract for the construction of a 1 story, 100 x 100 ft. factory, on East 21st St. and Superior Ave. Estimated cost, $60,000. A. A. Chilcote, Pres.

O., Cleveland—The Enamel Products Co., Eddy Rd. and Taft Ave., has awarded the contract for the construction of a 1 story, 60 x 190 ft. factory. Estimated cost, $75,000.

O., Cleveland—The Keetch Knitting Mills Co., 2101 Superior Ave., has awarded the contract for the construction of a 2 story, 60 x 147 ft. addition to its factory. Estimated cost, $100,000.

O., Delphos—The Glamorgan Tire and Rubber Corp. has awarded the contract for the construction of a 1 story, 60 x 300 ft. factory. Estimated cost, $75,000.

O., Marion—R. C. Ellsworth, 107 Hamilton Ave., Akron, has taken over control of the Marion Tire and Rubber Co., here, and plans to build a large addition to same.

Wis., Columbus—The Standard Oil Co., 105 Wells St., Milwaukee, plans to build a 1 story, 45 x 158 ft. filling station and office, on Main St., here. Estimated cost, $50,000.

Wis., Durand—The Wisconsin Canned Food Co., Fairchild, has purchased a site here and plans to build a 2 story, 60 x 125 ft. factory. Estimated cost between $45,000 and $50,000.

Wis., Horicon—The Columbus Canning Co. will soon award the contract for the construction of a 1 story, 96 x 109 ft. factory. Estimated cost, $40,000.

Wis., Jefferson—C. Baumann plans to build a 4 story, 60 x 150 ft. factory, on Main St., for the manufacture of milk products. Estimated cost, $40,000.

Wis., Kenosha—The Bruner Dairy Co., 418 Newell St., is having plans prepared by White, White & White, Engrs. and Archts., 414-15 Pub. Serv. Bldg., for the construction of a 2 story, 100 x 110 ft. dairy, on Salem St. Estimated cost, $80,000.

Wis., Merrill—The Borgeson-Heib Mfg. Co. has purchased a site on Main St. and plans to build a 2 story woodworking factory. Estimaed cost, $25,000.

Wis., Oconomowac—H. Meister plans to build a 4 story, 60 x 250 ft. factory, for the manufacture of toys. Estimated cost, $100,000.

Wis., Sheboygan—The Sheboygan Fruit Box Co., North 15th St., plans to build a 2 story, 70 x 200 ft. factory and power plant. Estimated cost, $40,000.

Wis., Shopiere—The Tiffany Milk Products Co. will soon award the contract for the construction of a 3 story, 70 x 110 ft. factory, on Main St. Estimated cost, $90,000.

Wis., West Bend—The Schmidt & Stork Wagon Co., Mill St., plans to build a 1 story, 100 x 300 ft. factory, on Oak St. Estimated cost, $60,000.

WEST OF THE MISSISSIPPI

Ia., Cedar Rapids—The Cedar Rapids Woodworking Co. will soon award the contract for the construction of a 2 story, 60 x 140 ft. factory. Estimated cost, $65,000.

Ia., Des Moines—The Hawkeye Tire and Rubber Co., 18th St. and Court Ave., is building a 3 story factory. J. E. Christie, Pres.

Ia., Muscatine—The Muscatine Packing Co. has awarded the contract for the construction of a plant, to consist of 5 buildings. Estimated cost, $1,000,000.

Minn., Fergus Falls—O. Fossen will build a 2 story, 36 x 110 ft. flour, feed and grain factory. Estimated cost, $75,000. Dennis & Knowles, 121 Mill St., Archt.

Mo., Joplin—A company is being organized to build an oxide zinc factory. Estimated cost, $300,000. Address J. Leopold, Secy., Chamber of Commerce.

Mont., Missoula—The Missoula Hide and Wool Co., 511 West Main St., has had plans prepared by C. H. Stehling Co., Engrs. and Archts., 401 4th St., Milwaukee, Wis., for the construction of a 2 story, 40 x 200 ft. tannery. Estimated cost, $25,000.

N. D., Grand Forks—The Industrial Comn. of North Dakota, Bismarck, is having preliminary plans prepared by C. L. Pillsbury Co., Engrs., Metropolitan Life Bldg., Minneapolis, for the construction of a flour mill, 2,000 to 3,000 bbls. daily capacity, and an 8 story, 40 x 160 ft. office building, etc. Estimated cost, $1,500,000.

Okla, Grandfield—The Uncle Sam Oil Co., 1409 Minnesota Ave., Kansas City, Kan., plans to build a 1 story refinery, on the G. Hancock farm, here. Estimated cost, $500,000.

Okla., Lawton—The Lawton Star Refinery Co. has acquired a 15 acre site north of the fair grounds, and plans to build an oil refinery. Estimated cost, $100,000. F. A. Parkinson, Pres.

Tex., Mineral—The Crazy Well Water Co. has awarded the contract for the construction of a 1 and 5 story, 130 x 160 ft. water bottling works. Estimated cost, $125,000.

Machine Tools Wanted

The following concerns are in the market for machinery and machine tools.

N. Y., Batavia—The Batavia and New York Woodworking Co., Buell St.—machinery for the manufacture of talking machines.

N. Y., Watertown—The Eager Electric Co., 522 Newell St.—power planer.

Penn., Avondale—The Eastburn Heines Engr. Co. manufacturer of steering wheels, new equipment and woodworking machinery.

Penn., Norristown—The Wagner Process Co., 563 Hamilton St.—1 power press for stamping and forming bottoms 12 in. diam., with 1½ in. flange, from 18 in. gage sheet metal. One No. 3½ B. double action toggle press. One power press for forming and cutting hanles made of 12 in. gage by 1 in. wide strips 7½ in. long. One No. 20 B. Bliss inclinable flywheel press. One power trimming shear, with rear gage for cutting 14 in. gage sheets 26 in. wide. One No. 20 Bliss power squaring shear to handle sheets up to 36 in. in length of No. 14 gage stock. One power bening roll for 14 in. gage sheet 26 in. long. One rotary shear for cutting bands of 14 in. gage steel in drain from 6 to 12 in. and ⅜ to 2 in. wide from welded cylindrical form 24 in. long. One No. 107 Bliss rotary slitting shear.

Penn., Philadelphia—Greisler & Abranson, Lafayette Bldg..—garage equipment.

Penn., Wilmerding—The Westinghouse Air Brake Co.—milling machines.

Mich., Detroit—The Commerce Motor Car Co., Mackie St.,—assembling plant equipment.

Mich., Detroit—The Detroit Graphite Co., 12th St.—grinding machines.

Mich., Detroit—The Liberty Investment Co., 416 Free Press Bldg.—small tools, vulcanizing sets, etc., for general repair of automobiles.

Mich., Galesburg—The Kalamazoo Chain Co.—shears and forging equipment.

Mich., Yale—The Yale Woolen Mills—textile machinery.

Mich., Muskegon Heights (Muskegon P. O.)—The Shaw Electric Crane Wks., McKinney St.—conveyor, drill presses and boring machines.

O., Cleveland—Bd. Educ., 6th St. and Rockwell Ave.—drills and presses for manual training department.

O., Cleveland — The Johns Stamping and Machine Works Co., 1715 Leonard St.—a 10 ft. x 14 gage capacity squaring shear, and a No. 5 geared Rockford press.

O., Cleveland—The Ohio Heating and Pipe Bending Co., 1063 West 11th St.—2 lathes and 2 drill presses.

O., Columbus — The Allen Motor Co., 400 Dublin Ave.—vertical boring mill, a 2 spindle Jones-Lamson turret lathe, and a large radial drill.

Ia., Davenport — M. F. Heyer, 709 Perry St.—sausage and packing equipment.

Mont., Missoula—The Missoula Hide and Wool Co., 511 West Main St.—tanning machinery.

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